American Machinist

Volume 66 New York, February 24, 1927 Number 8

What are the reasons for replacing obsolete equipment?
How soon should new equipment pay for itself?
What are the steps taken in buying equipment?
Is group or individual motor drive preferable?
Is a repair cost record worth while?
How are obsolete machines disposed of?
What are the faults of machine tools?
How keep informed of developments in equipment?

Conclusive answers to these questions are of extreme importance to the user of shop equipment. The answers have been given in the *American Machinist* in its series of articles, "Getting the Most Out of Your Machine Tool Dollar." But not all of the leaders of the machinery industries think alike on such subjects and the problems are likely to require different answers in different plants. Therefore cross-sections are presented here of the articles as a whole, the statements of company policies being quoted or abstracted, as they apply to the several questions.

In this article, the LAST *of a series of eight, answers are given to the question*

How Keep Informed of Developments in Equipment?

Illinois Central—It is a part of the duties of the supervisor of shop machinery and tools of the Illinois Central Railroad to search out new equipment and to visit the shops of the road at frequent intervals to keep informed on the condition of shop equipment. Master mechanics and shop foremen are expected to acquaint themselves with improved equipment and methods. They are sent to conventions and exhibitions of machines, and keep abreast of the times by reading of practices in other shops. The Illinois Central depends, also, upon the catalogs, letters, and advertisements of manufacturers, and upon their initiative in seeking out railroad jobs adapted to their machines, or to which to adapt their machines. The item mentioned last is considered of great importance.

International Harvester — The superintendents of the individual plants of the International Harvester Co. are responsible for maintaining and replacing the equipment in their plants. They keep informed of the development of machine tools by visits to outside plants, by visits to other Harvester plants, by reading the publications devoted to the machinery industries, through advertisements, and from their contact with salesmen.

SKF Industries — The time-study department of SKF Industries, through which all suggestions for equipment clear, is constantly on the alert for better equipment. The same statement is true of the executive members of the organization. Contacts are made through reading of new equipment in the technical press, by talking to the machinery builders' representatives, by advertisements, through visitors, and by taking trips to other shops.

Delco—The usual channels are employed by Delco (Dayton Engineering Laboratories Co.) to keep in touch with new equipment: Technical magazines, salesmen, visiting.

Westinghouse—At each of the plants of the Westinghouse Electric and Manufacturing Co. there is a department, reporting to the works manager, that devotes its entire time and effort to the study of manufacturing methods and equipment. These departments control groups of demonstrators, each of whom specializes on one type of machine tool and makes a study of what the market has to offer in his particular line.

According to the director of Works Equipment, "The demonstrators, in a sense, act as salesmen for the ma-

chines they represent, in an effort to improve manufacturing conditions. The entire works is their field and they are in competition with one another. . . . This arrangement results in beneficial comparisons, such as milling machines versus surface grinders, engine or turret lathes versus vertical mills, and single-purpose drills versus multiple or gang drills."

The Westinghouse company, while depending upon its demonstrators, gladly accepts data from the builders of machines, and frequently submits drawings or sends samples to tool manufacturers for comparison estimates.

The Spicer Manufacturing Corporation files all of the machine tool data that it can get hold of, and uses it constantly in striving for lower costs. Information furnished by machine tool salesmen is depended upon to a great extent.

Hoover—To the foremen of the Hoover Company has been delegated the duty of assisting their production manager in discovering the equipment best suited to the company's needs. To keep the foremen posted the company subscribes to all of the magazines applying to his job. The new equipment sections of the magazines are watched closely and the machines described are discussed at foremen's meetings. Contact of machine tool salesmen is with the purchasing department always and sometimes with the production manager. Machinery expositions are another source of information. Still another is the factory visit, on which the higher foremen are sent out at least once a year.

The Timken Roller Bearing Co. encourages its factory executives to visit other plants, the technical magazines are studied, and the machine design and engineering departments are kept always on the lookout.

Corona—Lacking the average amount of personal contact with salesmen, because its factory is located away from other industrial centers, the Corona Typewriter Co. sends its men out to these other industrial centers and to machinery expositions. The technical publications that deal with machine and tool problems are studied, with especial regard for descriptions of development in the utilization of tools and new units in the field of machine tools. In spite of the lack of contact, machinery salesmen have been valuable sources of information.

A source of information not usually recognized is given credit by the Works Manager: "Finally, much information comes to us through people who visit our plant, and who, in going from department to department, will here and there drop suggestions or will even ask to see the department head interested in the problem in order to volunteer some useful information."

The Grand Trunk Railway System sends its foremen, and sometimes the men who are to operate new machines, to other shops where the machines are in use, to become familiar with the machines. It is a part of the equipment policy not to install machines that have not been "sold" to the men who are to control them.

National Cash Register—The efficiency engineering department of the National Cash Register Co. ". . . is a department that is continually seeking, finding, sorting, classifying, and using equipment information. It has files of catalogs and data that are essential in its work. It receives the technical magazines, is in touch with machine tool salesmen, and sends its representatives to machinery expositions and to other plants." Selected groups of foremen and supervisors, also, are sent on plant visits from time to time.

Gleason—According to the President and General Manager of the Gleason Works, "information concerning equipment of advanced or new design comes to us by way of the technical press and salesmen, and through our close contact with other machine tool builders. We know that we must reach out for all equipment information that we can get in order to keep our plant up to date."

Mechanical Bad Habits

BY CHARLES HOMEWOOD

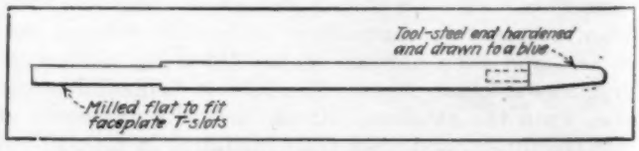
TO BE a good mechanic does not necessarily mean that a man has to be 100 per cent in all his dealings with machinery and tools. None of us are perfect in all lines of endeavor, and we all make mistakes.

I am of the opinion that a little comment on the bad habits of mechanics will serve to wake some of us up to the serious damages we often inflict.

Take for example, the bad habit of knocking out the live center from a lathe whenever a change is made for a chuck job. Many times the center could be left in but it becomes a habit to knock it out and to stuff the spindle hole with rags or waste.

In the shop where you are now employed, is there a regular knockout bar for each lathe, or do you use any old bar that will enter the spindle from the rear? Upon inspecting the rear end of the taper hole in the spindle, you will, no doubt, find a lot of scratches and small nicks which often cause the center to run out of true. It may be argued that these nicks and scratches have no effect, because the center does not extend back as far as the nicks, but the battered end of a knock-out bar often reaches down into the larger diameter of the taper hole, thus causing the nicks and scratches to come further forward.

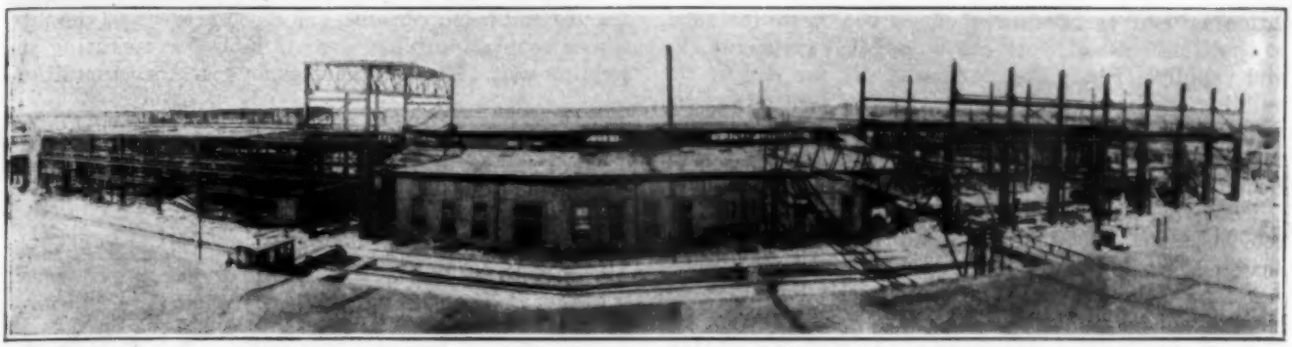
It might be well for lathe manufacturers to give more thought to this matter, and to provide properly designed bars for removing live centers. The bar shown in the sketch is a very good design, inasmuch as it serves a



Bar for removing centers and faceplates

double purpose; that of knocking out the live center and also of removing the faceplate. It is a common practice among some workmen to put a tool or piece of cold-rolled steel into the slot of the faceplate when removing it from the spindle. Often the tool or bar does not fit properly in the slot, and it becomes cocked at an angle when being bumped against a block.

Such a habit is an excellent one for straining the faceplate out of true and putting small nicks in the edges of the slots. In the sketch of the knock-out bar, it will be noted that one end is milled to fit properly into the T-slots of the faceplate.



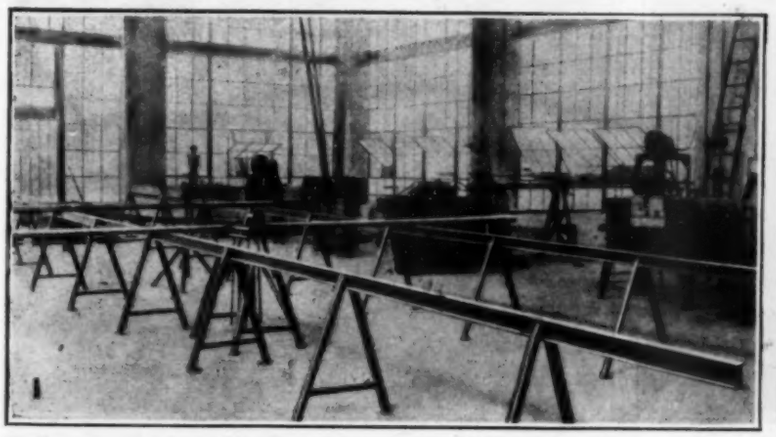
Meeting Repair Demands in the G.C.&S.F. Shops in Cleburne

By Frank W. Curtis
Western Editor, American Machinist

Construction of blacksmith and boiler shop to facilitate repairs of motive power—Miscellaneous operations and tools in the machine shop—Equipment for handling flues

REALIZING that inadequate facilities hinder the proper maintenance of locomotives, has led the Gulf Colorado & Santa Fé Railway Co. to make extensive improvements in its Cleburne, Texas, shops, which, when completed, will embody a modern repair plant for the handling of its motive power. The present shops were moved from Galveston in 1899 and have gradually been outgrown by the increase in size of motive power and by the amount of work to be handled. The headpiece illustrates the construction work, now being completed, for the blacksmith and the boiler shops that will contain up-to-date equipment. The smaller section of the building shown at the left will be the blacksmith shop; the remainder will be the boiler shop. As the construction reaches a point enabling the use of the end sections, the old shop shown in the center will be razed for the connecting structure. The building will be 514 ft. in length and 124 ft. in width. The boiler shop, measuring 390 ft. in length, will be equipped with a 175-ton traveling crane. Plans, now being prepared, call for the building of a machine and an erecting shop that will double the present capacity.

An interior view of the recently completed flue shop is shown in Fig. 1. Equipment suitable for the recon-



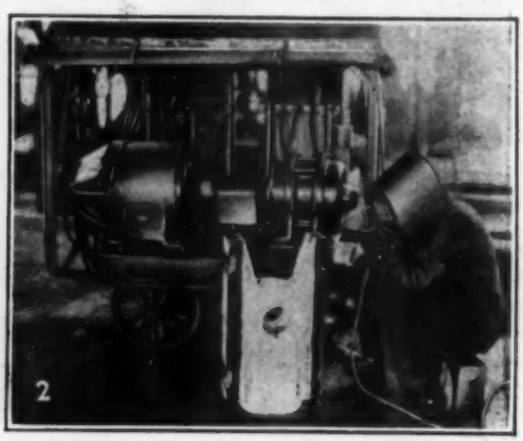


Fig. 1—Interior view of the new flue shop. Fig. 2—Building up a crosshead by welding

ditioning and reclaiming of flues has been installed, so that this class of work can be handled systematically and rapidly. Flues are started at the far end of the building and are brought by gravity racks to the various machines in which the necessary operations are performed. Safe ends are joined to flue lengths by an electric butt-welder equipped with a rolling attachment, so that the welded portion can be rolled while hot to remove the inner and the outer flashes. Flues are snagged on their outer ends on a specially-constructed grinding stand, so that a proper electrical contact can be obtained for welding. Safe ends are tumbled for the same purpose. The equipment makes possible substantial repairs at minimum cost.

Many worn parts are reconditioned by having their surfaces built-up by electric-welding. Work, such as rods, valve-motion parts, crossheads and miscellaneous shafts and castings, are transported to a department handling this class of repair. Heavier units, such as frames and bolster beams, are reconditioned at the pits, where connecting plugs are available for operating the welding unit. Fig. 2 illustrates an operator recondition-

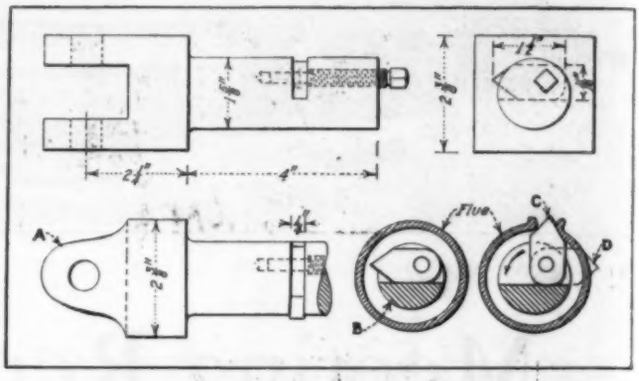
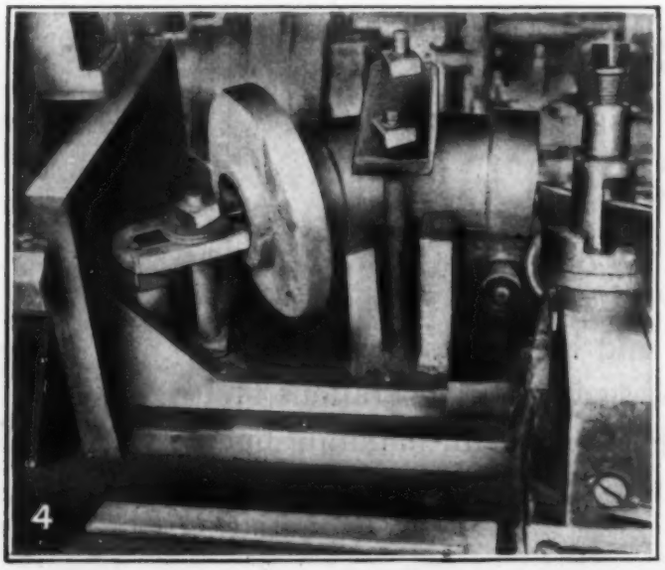
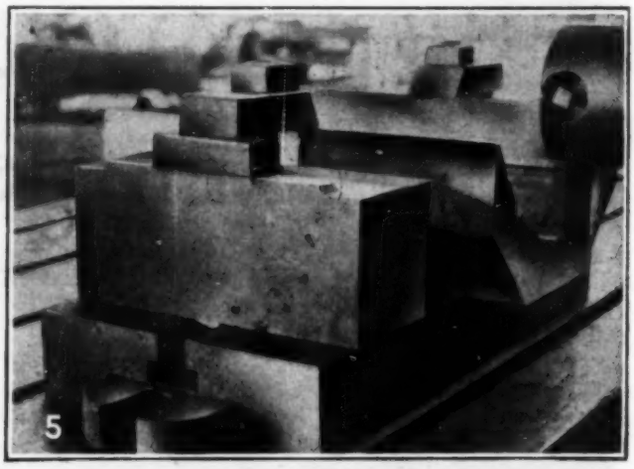
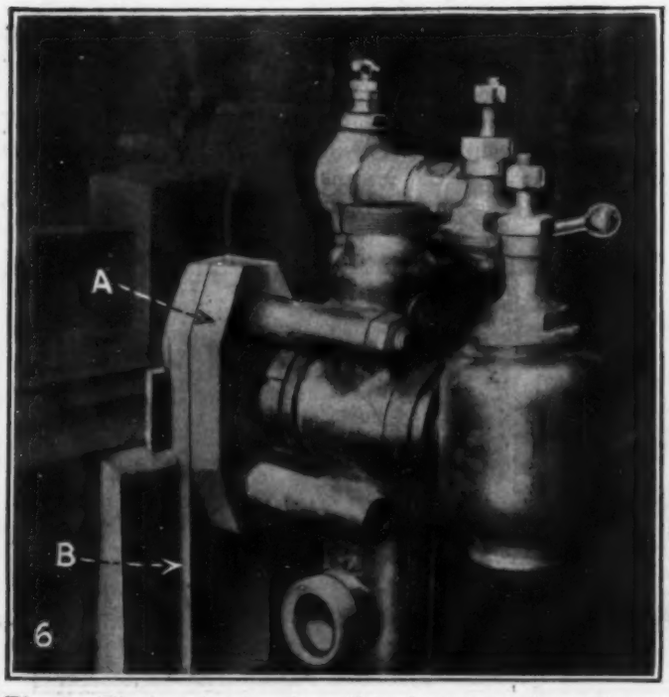


Fig. 3—Tool for cutting out flues







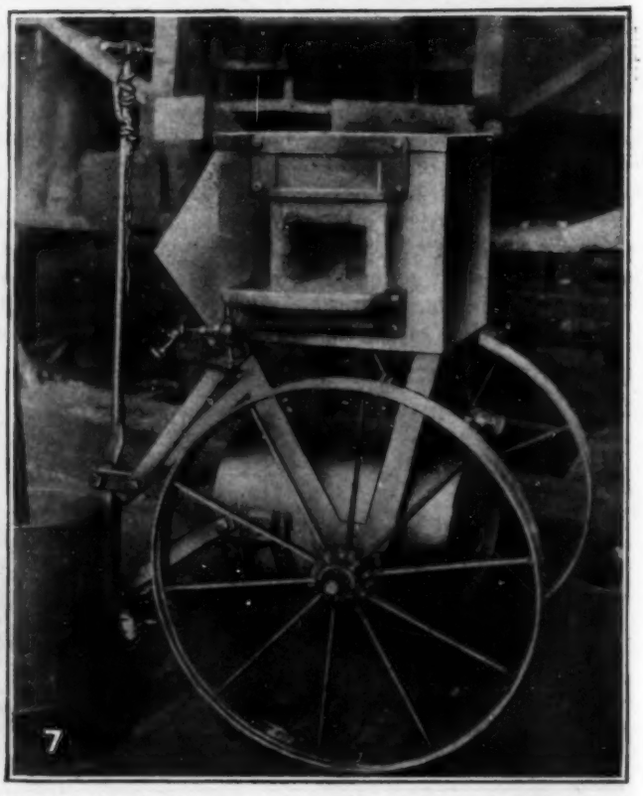


Fig. 4—Fixture for turning oil-tank goosenecks. Fig. 5—Fixture for boring engine-truck brasses. Fig. 6—Rack for testing and repairing injectors. Fig. 7—Portable rivet forge used in erection work

ing the gib slot of a crosshead. After the surface has been completely built up, it is machined to size. Four welding units are employed in connection with repairs.

Flues are cut from the boiler by the tool shown in Fig. 3, which is driven by an air motor connected to the drive end *A*. When the tool is inserted in the flue, it appears as illustrated at *B*, then, as the body revolves, the cutter *C* swings outward so that its cutting point breaks through the flue. Continued movement causes the cutter to take the position *D*. One revolution only is required to cut a flue after the cutter has pierced it. The cutter, mounted eccentrically with the body of the tool, is made of tool steel, hardened and ground. Its life varies from 50 to 200 cuts. The cutters are made in quantity lots so that an ample supply will be available.

Oil-tank goosenecks, having their ends positioned at different angles, presented a difficult machining problem until the turning fixture illustrated in Fig. 4 was devised. The parts are machined on both ends, one of which has a flanged face, the other end having a threaded section. The fixture is an angle-plate, mounted in a four-jawed chuck as shown. Two V-blocks, integral with the body, align the gooseneck, and two clamps hold it in place. After one end has been completed, the work is relocated, end for end, and clamped in a similar way.

Engine-truck and trailer brasses are bored as shown in Fig. 5, a horizontal boring machine being used. The fixture, accommodating different-sized brasses, has two clamps that grip the work by its edges, holding it firmly in place. The fixture is equipped with plates to accommodate smaller brasses.

An injector is an awkward unit to hold in a vise, and there is a possibility of its becoming sprung, due to clamping if so held. Both these difficulties are overcome by the use of the rack illustrated in Fig. 6, in which injectors are repaired and tested. The injector is attached to the swivelling plate *A* over two locating pins. A pin at the rear engaging holes in the plate, locks the work in the position desired. The rack, mounted in slides, as shown at *B*, has connected to it the piston of an air cylinder so that it can be raised to the position shown, or lowered to the floor. The purpose of this feature is to facilitate loading. The injector can be attached to the rack while it is on the floor, after which it can be elevated to the working position.

Mahr portable oil-fired rivet forges are used in the erecting shop for heating rivets and other small parts. One of these units is shown in Fig. 7. It has two wide-tired wheels, fitted with roller bearings, so that it can be moved readily about the shop. An 18-gal. oil tank, giving fuel sufficient for 10-hr. operation, is connected to the forge.

It seems to be generally agreed by members of the Gage Steel Committee that there is no known relation between hardness and resistance to wear. File-hard chromium steel seems to be more resistant to wear than file-hard carbon steel. Stellite is more resistant to abrasive wear than chromium plate, carbon steel or chromium bearing steel. For metal to metal wear, chromium plate is so far the best surface tested. Wear in gages is not the same as wear in deep drawing dies and results may or may not be comparable.

Locating a Job—Discussion

By H. Maplethorpe
England

I AM in sympathy with Mr. Cormack in his views as expressed on page 862, Vol. 64, of the *American Machinist*, and agree with what he says about the attitude of those who are responsible for receiving and answering applications from men looking for a job. It is a great mistake on their part and shows a want of tact and business etiquette.

It is also easy to understand the success of Mr. Cormack as a salesman. If all manufacturers only knew the wealth of orders that lay awaiting the salesman of mature age who knows what he is talking about, we should see more of this kind of salesman. I have many young men call upon me every year. I make it a rule to interview all of them and to try to learn all about the products that they offer. It is surprising how little some of them know.

We use a certain air-hardening steel of a well-known brand for lathe tools. This steel stands up to its work better than any other brand and to us it is of the geratest importance that it keep its keen edge since it is used for the skimming cut on shafts up to 30 ft. in length. The shafting, of course, must be uniform in diameter throughout its length and for each time the tool has to be reground at least 15 min. is lost.

Salesmen will tell me that their brands of steel will do it better, yet they cannot tell me why this should be the case. They cannot forge or grind a tool or even give instructions how to do it. In nearly every case where other steels have been tried they have failed to keep their edge. Some salesmen will go so far as to admit that they do not pretend to understand their use.

A Case in Mind

An illustration of Mr. Cormack's remarks on the remuneration of the salesman may be found in the following incident which occurred to a friend of mine. This man had served his apprenticeship with a firm at Leeds and afterwards transferred to a large engineering works in the eastern counties. As head draftsman for about 30 years he helped to build up for this firm a world wide fame as builders of mining equipment, generating plants and boilers. A time came, however, when he had to be succeeded by a younger man who was employed in the same office.

Owing to my friend's long and successful service with the company, the directors did not discharge him but offered him the agency for the west of England and Wales. This position he accepted although it was with a certain amount of soreness at heart since it was like leaving home to start a new life. In addition, he was a lame man, crippled with rheumatism, and somewhat afraid that he could not stand the rigors of the roads and weather.

During the first six months the enormous amount of orders he obtained astonished both the company and himself for he had beaten all records of every agent during the existence of the company. The directors were so pleased that they passed a vote of thanks and placed him on his old rate of pay. I am pleased to say that he filled that position for about 12 years to the entire satisfaction of the firm. Manufacturers will do well to take note of this object lesson.

Graphical Analysis of Circular-Arc Cams—Discussion

By H. Schreck

I READ with interest the articles by Prof. G. L. Guillet published under the above title on pages 671 and 715, Vol. 65, of the *American Machinist*, particularly since I had just presented before the American Society of Mechanical Engineers a paper* on almost the same subject. In making comparisons, wherever straightline motion is concerned, the results obtained by the two methods agree, but when motion on an arc is compared, such as the case of the pivoted follower in Professor Guillet's article in Fig. 12 on page 715, the difference can be great.

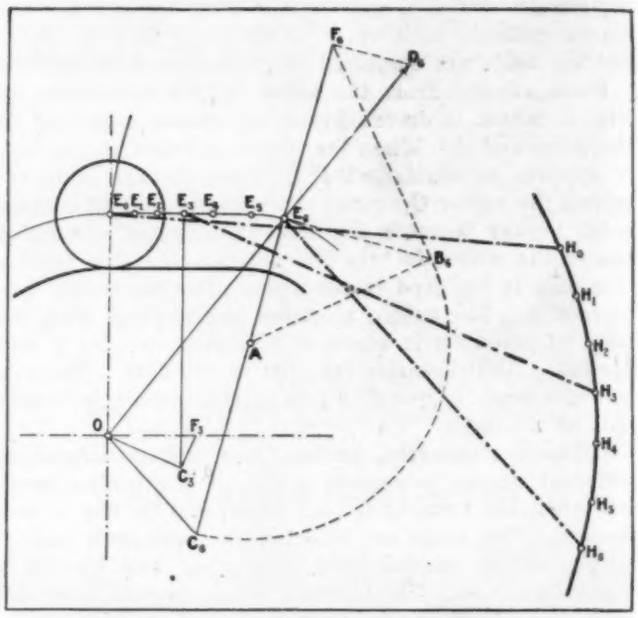
For the purpose of my investigation of an actual case, on the inclosed sketch I have drawn and analyzed by the methods suggested by Professor Guillet a cam of the following characteristics:

Cam diameter	4½ in.
Pitch diameter	6 in.
Roller diameter	1½ in.
Lift of cam	1 in.
Angle E_oOA	56°
Angle E_oOH_o	66° 40′
Length of lever EH	6 in.
R.p.m.	250
ω	26.18 radians per sec.
ω^2	685.4 radians per sec.^{2}

This cam had previously been figured mathematically by me from point to point in order to check the correctness of the graphical methods presented in my paper: these values will be here referred to as "estimated values."

The values of velocity and acceleration as measured on the inclosed sketch have been compiled in the accompanying table.

The values of OC in column 3 of this table were taken from the sketch, and in turn velocity, increase in velocity, and mean acceleration (column 6) were figured from it. The value for instantaneous acceleration was again taken from the sketch and listed in column 7. The final value for acceleration calculated from it is in column 8 and next to it in column 9 are the "estimated values."



This table shows that the difference in deceleration is small for this particular cam. The difference in acceleration is as much as 84 ft. per sec.^{2} But it must be said to the credit of Professor Guillet that in no place of his paper does he recommend that the process suggested for the tangent cam in Fig. 10 should be used in connection with a pivoted follower. But since the paper does not suggest a method for this case, the reader may assume that the method suggested in Fig. 10 holds also good for a pivoted follower.

This letter is therefore a supplement to the paper of Professor Guillet rather than a criticism of his good work. A graphical solution for more general cases may be found in my paper mentioned in the first part of this article. Mathematical proof is also given.

*"Kinematics of Cams, Calculated by Graphical Methods," presented at the annual meeting of the A.S.M.E., Dec. 6-9, 1926.

1	2	3	4	5	6	7	8	9
		Velocity			Acceleration			
Point	Increment of Advance	OC In.	$OC + \frac{\omega}{12}$ Ft. per sec.	Increase V' Ft. per sec.	$\frac{V'}{\text{Time}}$ Ft. per sec.^{2}	$OE + 2CF$ In.	$\frac{\omega^2(OE + 2CF)}{12}$ Ft. per sec.^{2}	Estimated Value Ft. per sec.^{2}
H_0	6°	0	0	0.697	174	3.00	172	
H_1	6°	0.32	0.70	0.763	191	3.16	181	181
H_2	6°	0.67	1.46	0.88	220	3.50	200	205
H_3	6°	1.08	2.34	1.10	275	4.12	236	248
H_4	7°- 4′-26″	1.58	3.44	1.93	408	5.17	296	328
H_5		2.46	5.37			7.66	449	533
H_6	5°-40′-39″	2.46	5.37	1.49	393	7.00	400	410
H_7	5°-40′-39″	1.78	3.88	1.40	369	6.42	367	384
		1.14	2.48					

Typewriters Are Built on Old Equipment

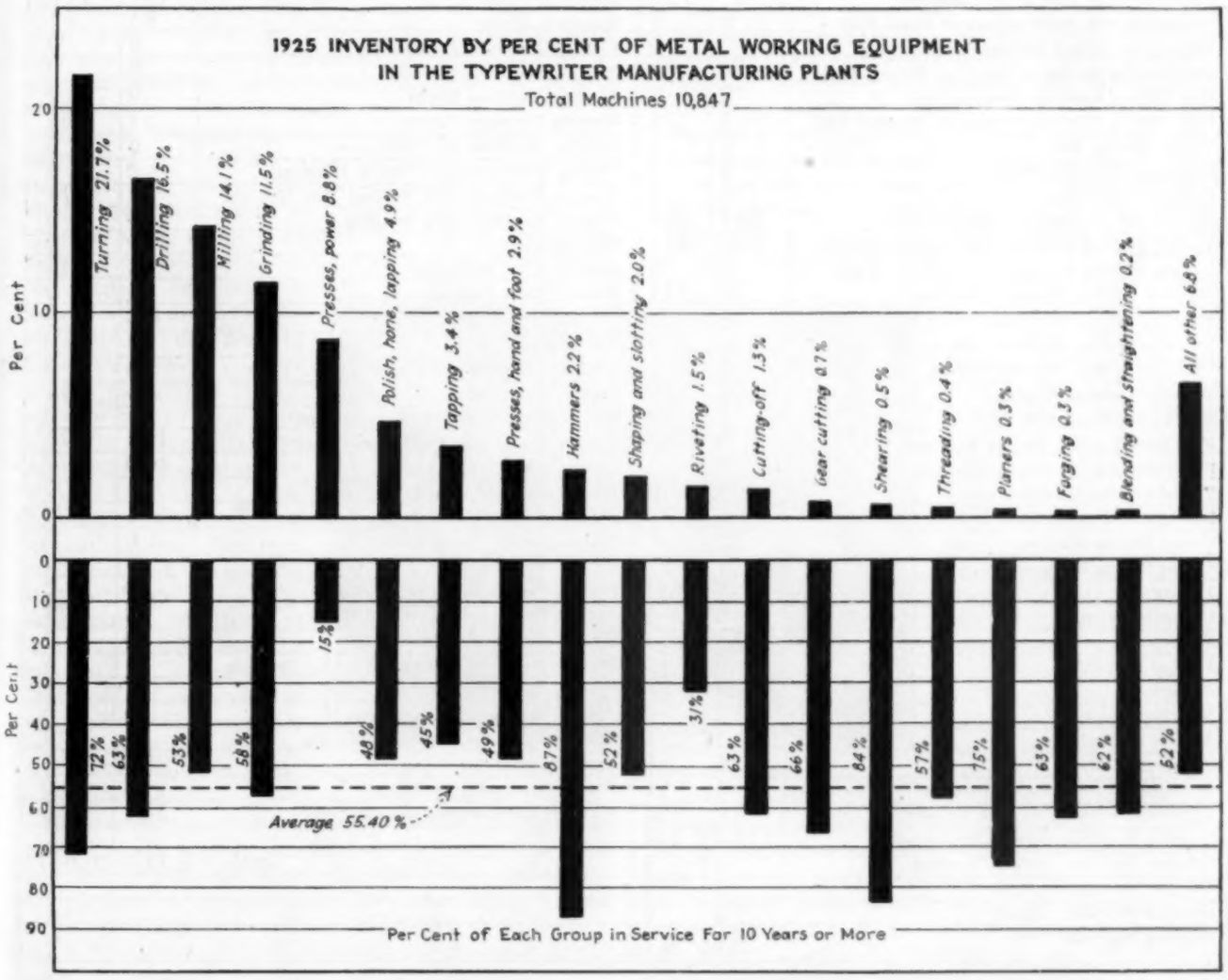
Over one-half of 11,000 metal working machines are ten years old

THERE are approximately 10,800 metal working machines in active service in the typewriter manufacturing plants. The plants themselves, employing 6 or more men, number 25 and employ a total of 15,600 workers. That the industry is an old one is evidenced by the fact that 55.4 per cent of these machines have seen 10 years or more of service in these plants.

The total of machines has been subdivided into groups according to operations and has been plotted in the chart shown below in terms of per cent of the total. At the bottom of the chart is shown the per cent in each group that has seen ten years or more of service.

Thus it is seen that turning represents 21.7 per cent of the total, with drilling 16.5 per cent and with seventeen other groups in varying amounts. Of these, the machinery in the power press group is the newest, while the group under hammers is the oldest in service. More significant is the fact that the two largest groups, lathes and turning machines, and drilling machinery are considerably above the average of 55.4 per cent old machines.

The body of the questionnaire from which the *American Machinist* obtained the inventory data is reproduced on the next page. It is filled in with the totals in each division for the industry. These figures were obtained from the actual returns by totaling the returns as to machines and as to numbers of men in the plants which are included in these reports.



METAL WORKING EQUIPMENT IN THE TYPEWRITER MANUFACTURING PLANTS

Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925	Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925
Engine Lathes	234	305	Grinding Machines, Floor, No Feed Attachments	56	83
Hand Turret Lathes	12	12	Grinding Machines, Bench, No Feed Attachments	411	625
Power Turret Lathes	15	21	Grinding Machines, Disk	27	110
Semi-Automatic Lathes	0	0	Grinding Machines, Belt	3	9
Hand Screw Machines	169	219	Grinding Machines, Centerless	0	3
Automatic Screw Machines, Single Spindle	645	1012	Polishing and Buffing Machines, Wheel	228	488
Automatic Screw Machines, Multiple Spindle	47	77	Polishing and Buffing Machines, Belt	0	0
Chucking Lathes	21	30	Polishing and Buffing Machines, Semi-Automatic	0	0
Multiple Spindle Chucking Machines, Rotary Work	0	0	Lapping Machines	0	3
Multiple Spindle Chucking Machines, Rotary Tools	0	0	Honing Machines	27	38
Speed Lathes	201	228	Cutting-Off Machines, Parting Tool Type	41	41
Bench Lathes	329	391	Cutting-Off Machines, Power Hack Saw Type	27	41
Tool Room Lathes	24	56	Cutting-Off Machines, Rotary Cold Saw Type	9	15
Wheel Lathes	0	0	Cutting-Off Machines, Band Saw Type	12	44
Axle Lathes	0	0	Cutting-Off Machines, Friction or Hot Saw	0	0
Forge Lathes	0	0	Shears, Knife	6	9
Hand Milling Machines	216	417	Shears, Rotary	0	0
Bench Milling Machines	74	77	Shears, Slitting	36	41
Plain (Knee and Column Type) Milling Machines	379	577	Nibbling Machines	0	6
Universal (Knee and Column Type) Mill. Mach.	56	89	Hammers, Steam	3	3
Vertical (Knee and Column Type) Mill. Mach.	12	47	Hammers, Pneumatic (not portable)	0	0
Lincoln Type Manufacturing Milling Machines	50	104	Hammers, Drop	53	65
Semi-Automatic Type Milling Machines	12	195	Hammers, Helve	101	110
Continuous Mill. Mach. Rotary or Drum Type	0	0	Hammers, Spring	53	62
Planer Type Milling Machines	0	0	Riveting Machines, Pneumatic	0	0
Gear Cutting Machines, Rotary or Milling Type	50	68	Riveting Machines, Hydraulic	0	0
Gear Cutting Machines, Hobbing Type	0	9	Riveting Machines, Steam	0	0
Gear Cutting Machines, Planing or Shaping Type	3	3	Riveting Machines, Power	53	166
Vertical Boring Mills	9	9	Forging Machines, Hot, Bulldozers	0	0
Horizontal Boring Machines	0	0	Forging Machines, Hot, Forging Machines	0	0
Radial Drilling Machines	6	6	Forging Machines, Cold Headers, Bolt, Nut, etc.	12	24
Upright Drilling Machines, One Spindle	601	758	Forging Machines, Cold, Swaging	9	9
Upright Drilling Machines, Two or More Spindles	450	823	Bending Brakes	0	6
Upright Drilling Machines, Two or More Heads	0	0	Bending Rolls, Horizontal	12	15
Sensitive Drilling Machines, One Spindle	38	121	Bending Rolls, Vertical	0	0
Sensitive Drilling Machines, Two or More Spindles	36	86	Straightening Rolls	3	3
Sensitive Drilling Machines, Two or More Heads	0	0	Punching Machines	0	0
Two-, Three- and Four-way Drilling Machines	0	0	Combined Punches and Shears	3	9
Tapping Machines, Single	166	355	Presses, Hand, Arbor	44	92
Tapping Machines, Multiple	3	15	Presses, Hand, Light Punch Press Work	0	0
Pipe Threading and Cutting Machines	6	9	Presses, Foot, Light Punch Press Work	118	225
Bolt Threading and Cutting Machines	3	3	Presses, Power, Crank Type	118	873
Thread Chasing Machines	0	0	Presses, Power, Toggle Type	9	27
Thread Hobbing Machines	3	9	Presses, Power, Double-Acting Type	3	21
Thread Milling Machines	0	0	Presses, Power, Dieing Type	0	3
Thread Rolling Machines	12	21	Presses, Power Automatic	0	3
Planers	27	33	Presses, Power, Trimming Presses	0	0
Open-side Planers	0	3	Presses, Power, Forcing, Arbor, Wheel	18	21
Shapers	83	121	Presses, Power, Baling	0	3
Vertical Shapers	0	12	Presses, Hydraulic, Bending, Forming, Drawing	0	0
Slotters	30	86	Presses, Hydraulic, Forging	3	3
Broaching Machines	3	9	Presses, Hydraulic, Flanging	0	0
Keyseating Machines	3	3	Presses, Hydraulic, Forcing, Wheel, etc.	0	0
Centering Machines	6	6	Presses, Hydraulic, Baling	3	3
Grinding Machines, Plain Cylindrical	3	21	Presses, Hydraulic, Extruding	0	0
Grinding Machines, Universal Cylindrical	89	110	All other machines and miscellaneous	352	696
Grinding Machines, Surface, Reciprocating	104	219			
Grinding Machines, Surface Rotating	0	3	Total	6,123	10,847
Grinding Machines, Internal	0	0			
Grinding Machines, Cylinder	0	0			
Grinding Machines, Cutter	41	71			

A Glimpse in a Modern File Shop

Special grinding machinery for finishing blanks—How the teeth are cut—Designation of grades—Inspection between operations

THE rotative speed of the stone is varied inversely with its diameter. Since the diameter is diminished by wear and dressing, the speed is increased accordingly to maintain a surface speed of about 3,000 ft. per min. In order that grooves may not be worn in the face of the stone, the spindle upon which it revolves is given a slow reciprocating motion of 3 or 4 in., actuated by a barrel cam.

To keep the surface of the stone smooth and in condition to cut, there is a corrugated roller of chilled iron, similar to some of the dressers used in connection with wheels of artificial abrasive. It runs in bearings of its own and is in contact with the stone at all times. This is called the "hacker-bar." It rotates by contact with the stone but has no end movement, the relative movement necessary to dress the stone being set up by the reciprocations of the stone itself.

The work-carriers are interchangeable, different carriers being provided for different sizes and shapes of files. Having ground the flat sides of a loading of blanks, the blanks may be turned over to grind the opposite sides without adjustment, but to grind the edges of the same files another carrier is substituted. The shape to be ground is determined in a measure by the shape of the back of the carrier where it bears against the rollers. Having been ground on all surfaces, the blanks next undergo an operation called "stripping," which is actually neither more nor less than drawfiling. On very small files and upon some shapes of larger ones, especially rounds, this work is done by hand, but the majority of files can be "stripped" on machines. One of the special machines for this purpose may be seen in Fig. 8, with a file in the carrier.

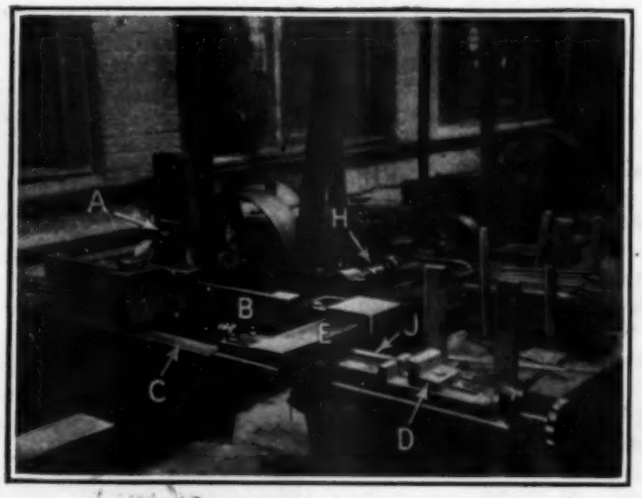


Fig. 8—The stripping machine

These machines are double, the two sides being alike. A short shaft near the middle of the frame has upon each end a disk and crankpin, the latter taking its bearing in a rectangular block that moves up and down in the slotted yoke *A*, causing the latter to slide back and forth along a stationary guide-bar *B* which is attached to the frame of the machine. Connected to the crosshead, of which the slotted yoke is a part, is a long flexible bar *C*, on the end of which is a holder *D* to carry the files to be stripped.

The holders move back and forth in guides that have a limited amount of vertical movement and are supported by springs, the pressure of which may be adjusted to suit the nature of the work. The rate of the reciprocating movement may range from 40 to 80 double strokes a minute, according to the size of the machine.

Clamped to the underside of another sliding bar, marked *E* in Fig. 8, is a short file that is cut especially for the work of "stripping." It has no tang, being merely a short piece of stock of rectangular section, cut on but one side and over but a portion of its length. It is called a "hone," but that alters neither its characteristics nor its purpose.

The bar *E* has a slow reciprocating motion in a direction at right angles to that of the file holder, actuated by a barrel cam at *H* that is driven by a separate belt. A file blank to be stripped is shown at *J* in the holder.

One operator can attend to both sides of the machine, and even attend other machines if the blanks are of medium or large size. Smaller machines run proportionately faster and require more of the operator's time. The operation is obvious. It is merely drawfiling by machinery. Chalk is used freely on the blanks to prevent "cats-teething": a term sufficiently explanatory to all whose experience includes drawfiling. A blank properly stripped presents a very smooth and finished appearance without perceptible scratches. What is probably the greatest advance in the art of file-making over the methods of the old-time hand worker, is represented by the cutting machine, of which Fig. 9 shows the principle. These machines are of many sizes and vary somewhat in detail of construction, but all of them comprise essentially the same movements and parts: A chisel that is held in a reciprocating hammer-bar, a table (or carrier) to hold the blank to be cut, and means of moving the table forward at a rate

Conclusion. The first part was published on page 259.

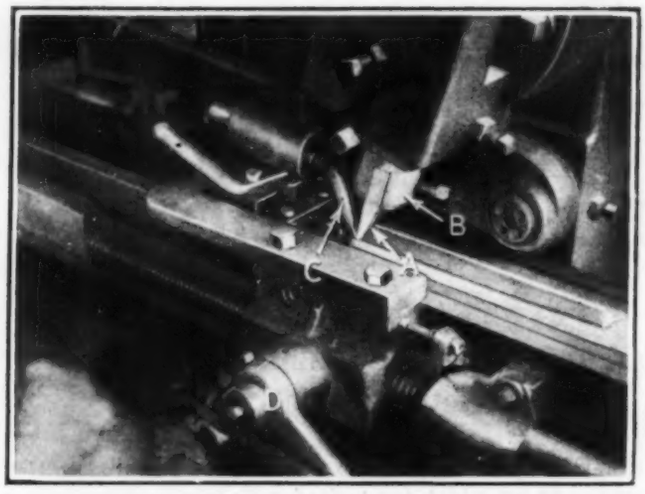


Fig. 9—The file cutting machine

that can be varied with relation to the speed of the machine.

The hammer-bar is carried in a swiveling head that can be adjusted in a vertical plane to any desired angle relative to the surface of the table. The table is moved by a screw and nut at a rate relative to the successive blows struck by the hammer-bar to produce any desired "pitch," or number of teeth per inch, on the file. The speed of the machine may vary from 600 blows per min. by the larger sizes to nearly 2,400 by the smaller ones.

Some of the smaller machines are double and the operator attends to both sides. Larger machines are single and require all of an operator's attention. The carrier of the machine shown in Fig. 9 slides in a semi-circular guide-way, to which it is closely fitted, and can thus be tilted to any reasonable angle, as is required when cutting the backs of half-round files. Round files are usually carried in a separate indexing fixture that allows them to be turned in short increments for the successive cuts. The chisels always have a straight edge.

The shape of the chisel can be seen quite plainly at *A* in this picture. A setscrew holds the chisel in a slot at the end of the hammer-bar *B*, which bar can be adjusted about its own axis to allow the chisel to cut at any desired angle across the face of the file blank.

The hammer-bar is actuated by a cam that serves to lift both it and the chisel away from the work against the compression of a heavy spring, which spring is usually a cushion of solid rubber. It is the spring, not the cam, that furnishes the power to strike the blows to cut the teeth of the file. The amount of compression given to the spring is adjustable by means of a hand-wheel and screw at the top of the machine, the operator adjusting the machine to strike light or heavy blows by turning the handwheel.

The blank is held entirely by the tang by a simple clamping fixture. It lies upon a strip of zinc that is interposed between it and the carrier, principally to prevent damage to the teeth that may be already cut on the under side. Lead was formerly used for this purpose—exclusively by the hand workers—but as lead was once suspected of affecting the health of the workers by reason of the poisonous nature of its oxides, zinc is now substituted.

A bent finger *C* is carried in a holder on the swiveling head. Its purpose is to hold the blank steady on the carrier and to prevent it from rebounding under the influence of the rapid blows delivered by the chisel.

A locknut, operated by a lever at *D*, enables the operator to disengage the screw and move the carrier along the slide freely, as when coming back to the starting point to reload. The cut is always from tip to tang. The angular adjustment of the head determines the amount of the undercut given to the file teeth.

On all double cut files the first cut is called the "overcut"; a survival of ancient nomenclature that is, so far as the writer has been able to discover, without explanation. The second is called the "upcut." The object of the overcut is not to produce cutting teeth, but to break up into small sections the teeth that are to be formed later by he upcut. The term "second-cut," so commonly misused, refers only to the *pitch* of the teeth of certain files, and absolutely to no other condition. After the overcut has been put on, the files are returned to the stripping machines where the teeth made at this time are drawfiled and reduced to a uniform height.

As has been stated, the edge of the chisels with which the teeth of the files are cut must be straight. To facilitate keeping them in this condition a special form of wheel is provided upon which to grind them. The wheel is a circular lap—made of lead and charged with abrasive of about 70 grain—which is mounted upon a vertical spindle that brings it to a convenient height above the floor. Fig. 10 shows the construction. The manner of using it is obvious.

After each operation has been performed, whether upon the blanks or upon the cut files, they are carefully inspected and any that show defects of any kind are rejected. On all files that pass the final inspection the trademark is stamped at the heel, or on the tang, by special automatic marking machines.

In the hardening room at the Simonds plant there is darkness but no mystery. Natural light is excluded and the working light is limited to that from shaded electric bulbs and to the glow from the furnaces. The work proceeds with the same orderly attention to detail that obtains in the rest of the plant.

Temperatures are under constant observation and control by means of registering and recording pyrometers. The brine in the quenching tanks is maintained

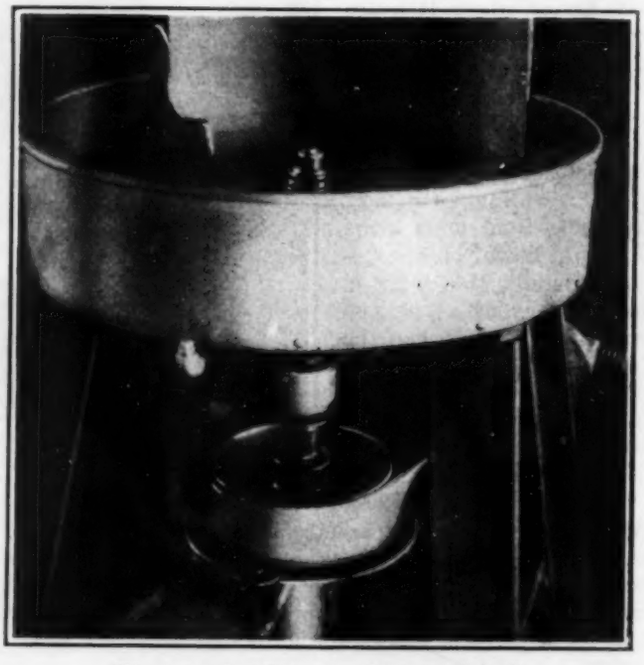


Fig. 10—Lead lap to sharpen chisels

at a constant temperature, as closely regulated as the heats of the furnaces, by a refrigerating machine.

The files to be hardened are first brushed with a preparation of clay to fill the teeth, and are then baked to harden the clay and expel the moisture. They are heated in lead and quenched in brine, with no secret process or mystic rites not commonly practiced by every toolmaker and heat-treater who has occasion to harden and temper steel. There is no drawing operation, the right degree of hardness being obtained by careful selection of the heating and quenching temperatures, which may vary somewhat in accordance with the size and nature of the file.

Little kinks—known to all hardeners—are practiced, such as bending the file before quenching it to make it straight when it comes out of the brine. A half-round file, or a file with teeth cut upon but one side, is sure to be curved by the hardening process. To forestall it and bring the files out straight the hardener deliberately strikes the red-hot file across a block of lead and bends it in a direction opposite to that in which it will spring in quenching. The expert hardener does this repeatedly and without conscious mental effort, and rarely does he bring out a crooked file.

All files are tested for hardness immediately they come from the quenching tanks. The manner of applying the test is to draw a pencil of hard steel over the length of the file. If there is any perceptible slippage as the pencil passes over the file indicates softness or soft spots and the file is thrown out for investigation.

After being hardened, the files are cleaned by introducing them into a steam blast under a hood. The blast blows away all remaining vestiges of the clay that was put on them before hardening, and leaves then clean. The temper is drawn from the tangs by dipping them, in bunches, into a lead pot that is maintained at a low red heat, and quenching them in oil before the heat runs up into the file. The color from this operation is readily discernible on any new file.

After the files have passed the final inspection they are brushed with oil to preserve them against rust, and are then ready for packing.

Dimensioning Drawings — An Art — Discussion

By James McIntosh

THE article by John S. Carpenter, under the title given above, and published on page 978, Vol. 65, of the *American Machinist* interested me, and I would like to discuss some of the points contained therein.

While the statements as to the function of a drawing in conveying the thoughts of another in a definite form as to detail, figures, total dimensions and finish marks are justified, such a drawing cannot be considered complete. Fin. or *f* has no definite value, the amount of finish allowed being a matter of conjecture, due to the absence of some definite amount that should be specified.

The value of indicating a definite amount of finish cannot be overestimated. In the case where elaborate jigs and tools are used, the amount of clearance in a jig and the weight of metal to be removed are problems of considerable importance.

The general result due to abnormal amounts of finish means that the surplus weight of a casting is an item of expense, it also means increased power, abnormal heat, distortion of the casting, more rigid equipment and a greater degree of tool wear and tear. The removal of an amount equal to one-third of the thickness of the section will often expose porosity at the junction of a rib, as is indicated where there is a T-section. The center of the mass is usually porous, but the porosity will not be exposed in the case where a minimum of finish is specified.

It is suggested that while there can be a definite indication as to the amount of finish, there can be no specific rule, as will be evident in the case of a crankcase for an automotive engine. The total length may vary $\pm\frac{1}{8}$ in., due to shrinkage, and if the total depth is one-fourth the length, by the same rule $\pm\frac{1}{32}$ in. would be a safe factor to use, but the fact that the casting is usually bent or warped in cooling means that the amount of finish should be based upon length, to be safe. In the first case variation due to shrinkage, in the second warping is the vital point to be taken into consideration.

What are the requirements that make a drawing complete? It must convey the necessary information to produce a definite idea conceived by another. Three or more views should indicate the structure, and in some cases they should be supplemented by several sections to complete the picture, so that it can be seen and understood from every angle. Figures should be added to decide the actual dimensions of each and every point indicated, so that there can be no doubt as to the relation of one part to another.

The use of notes to express thoughts, a complete specification as to materials used, the degree of accuracy required, together with a table of machine operations and their sequence during the process of manufacture, are quite usual and satisfactory.

Perhaps the above may be considered as complete. So far as the designer is concerned it might be, if the drawing were to be put in a frame and hung on a wall as a decoration. But if it is to be used as a working drawing, it must be subjected to careful scrutiny. So that a patternmaker will know that the vital requirements in producing the casting are practical, he should know the amount of finish required and it should be determined by those interested in the machining operations, it being assumed that the design has been considered from a machine-shop standpoint before the drawing has been issued. The drawing should be checked by every department through which it must pass, to qualify as being up to the standard as indicated, and as being capable of being understood down to the most minute detail.

The amount of finish may be indicated as follows: 1F = $\frac{1}{32}$ in., the minimum, as in the case of a simple plate, door or cover, and usually represents a surface that is to be ground flat. 2F, 3F, 4F, 5F, 6F may be used to indicate $\frac{2}{32}$, $\frac{3}{32}$, $\frac{4}{32}$, $\frac{5}{32}$ or $\frac{6}{32}$ in. finish. Such a method is valuable, in that those interested know what to expect, and they should decide and O.K. the amount. The value of working and inspection limits cannot be overestimated as a means of pointing out the vital and important dimensions.

Book Reviews

Mechanical World Year Book. Three hundred forty-eight pages, 4x6 in., cloth-board cover. Published by Emmott & Co., Ltd., 65 King St., Manchester, Eng. Price, 1s. 6d.

Following former editions, the 1927 volume of the Mechanical World Year Book is a small encyclopedia treating various mechanical subjects in a condensed manner. It contains practical data most usually referred to in the different fields it covers.

Each section is comprised of a brief outline of the topic, formulas, tables, and miscellaneous technical data. Information relative to steam and oil engines, constituting the first portion of the book, covers pressures, horsepower, lubrication, boilers, condensers, and constructional details. The section on metals and alloys covers such materials as iron, steel, copper, lead, and nickel, showing properties, comparative hardness, stresses, strains and heat-treatments. The division devoted to toothed gearing has been rewritten and covers various formulas and calculations for spur, bevel and worm gearing.

Other subjects treated are grinding, gages, fits, ball and roller bearings, lubrication, pipes and tubes, rails and wheels, belt conveyors, foundations for machinery, and foundry practice. Pages for memorandum and a diary are included.

Anleitung Zu Genauen Technischen Temperaturmessungen. By Professor Osc. Knoblauch and Dr. K. Hencky. One hundred seventy-four pages, 8¼x5¾ in. Seventy-four diagrams and illustrations. Published by the Verlag Von. R. Oldenbourg, München, N.W. 2, Germany. Price, paper covers, 9 marks, cloth 12 marks.

This book is intended as a complete elementary treatise on the methods of measuring temperatures. It is a revised edition of an earlier work by the same authors. It is divided into three main parts, taking up the theory and calculation of heat, the application of thermometers to temperature measurement, and the recording of temperature measurements. These parts are in turn subdivided into 15 chapters, each treating of separate phases of the subject or instruments for temperature measurement. Line drawings are employed largely as illustrations.

The book treats of the theory and practice of the various types of heat measuring instruments such as the expansion thermometer, the thermocouple, and the electric resistance thermometer. Although planned primarily for the physical laboratory, the book should also be valuable for the shop interested in tests involving temperature measurements.

The Oxwelder's Manual. Instructions for Welding and Cutting by the Oxy-Acetylene Process. Ninth edition, completely revised. Two hundred sixteen pages, 6x9 in., flexible cloth covers. Illustrated and indexed. Prepared and published by the Oxweld Acetylene Co., 30 East 42nd St., New York, N. Y. Price $1.

Although this booklet largely concerns itself with the equipment made by this company, with particular reference to the illustrations of apparatus, nevertheless the treatment of the text is technical in character, and a large amount of general information is imparted that should be valuable to one engaged in this class of work. Many practical examples of various types of welding are described and illustrated.

The book is divided into twenty-five chapters. In the first seven, all the apparatus necessary for welding and cutting, including gas generating equipment, is described as to design and structural details. The eighth chapter is devoted to cutting of steel and cast iron, while the following thirteen chapters take up in turn the welding of steel in various forms, such as sheet and pipe, of cast iron, brass, bronze, Monel metal, aluminum, alloy steels, and copper. One section treats of Stelliting, another of precautions and safe practices, and in the last chapter a typical shop layout and organization is described.

Applied Budgeting. By Henry Bruere and Arthur Lazarus. Two hundred forty-eight pages, 6x8¾ in., flexible covers. Published by the A. W. Shaw Co., Cass, Huron and Erie Streets, Chicago, Ill. Price $7.50.

A practical treatment of financial and production budgeting, as specifically applied to eleven branches of industry as follows: Oil, railroad, bank, newspaper and magazine publishing, contracting and construction, metal-working, department store, canning, hotel, ice-cream, and garment.

The book is intended to serve executives in the eleven branches of business dealt with and allied industries, practicing accountants and engineers, in the specific or allied fields, and as a source book to students of management.

The first chapter discusses the principles and fundamentals of budgeting in business, advantages and benefits in general, with an analysis of existing objections to budgeting.

Separate chapters cover the technical treatment and application of budgeting in the aforementioned eleven branches of business, with accompanying forms, charts, schedules and reports applicable to each business. The collation of specific data represents contributions and specialized study of representative concerns in each industry.

The final chapter deals with budget essentials, with a summary of methods, periods, and basis of budget compilations as actually used by twelve listed concerns.

Each chapter includes a bibliography, and there is an index to the 113 forms and charts exhibited throughout the book, with an alphabetical subject index at the end.

Supplementary Problems for Mechanical Drawing and Blue Print Reading. By John F. Faber. One hundred thirty-six 6x9-in. pages, cloth boards. Illustrated. Published by the Bruce Publishing Co., Milwaukee, Wis. Price $1.50. The problems, which are presented in the form of drawings for copying, are primarily intended for original work supplementing an introductory course in the subject, although the plates form a key to the author's book, "Mechanical Drawing Problems." The book is divided into eight parts: elementary freehand sketching, instrumental drawing, sections, intersections and developments, pictorial drawing, detail drawing, assembly drawings, and lastly useful data and tables. The book is indexed.

Hand-to-Mouth Buying and the Equipment Industries

By ERNEST F. DUBRUL
General Manager, National Machine Tool Builders' Association

Equipment industries always have had hand-to-mouth business—Stabilization of general buying will assist equipment builders—Business now carried on with better knowledge of facts

HAND-TO-MOUTH buying is an excellent illustration of the old adage "What's one man's meat is another man's poison." For the merchant, hand-to-mouth buying has many advantages, whose details have been or will be set out by other speakers at this conference. But there is such a thing as increased cost due to getting out short orders instead of longer runs. Perhaps a sane compromise is to place orders ahead in reasonable volume without indulging in gambling on a reckless basis. When there was a marked amount of gambling in goods, the merchant's end of the transaction was mostly financial. He had a small physical problem of providing storage for the goods he carried in anticipation of a heavy demand. Some merchants, who had missed their guess and should have taken in goods that had turned into overstocks, had no storage problem of that sort because they simply canceled orders, or returned goods to the manufacturer and stuck him with the losses they themselves created. The manufacturer is not likely to hear that tale as often in days of hand-to-mouth buying as he does when buyers are foolishly gambling in goods and making a sellers' market.

> Hand-to-mouth buying has had the effect of stabilizing demand. With relatively regular flow of orders the average volume of business during the last four years has been notably bigger than for any similar period

The manufacturer has to deal with the financial side of the problem just as the merchant must, but he also must deal with many physical factors that do not enter into the merchant's problem. On the whole, balancing up the big losses against the occasional profits of the feast-and-famine way of doing business, the weight of sound opinion is heavily on the side of the stabilized business, which the gambling policy does not produce.

The equipment industries of the country are in a distinctly different position than that of any industry making consumer goods. In a broad sense the equipment people always have had a hand-to-mouth business, and they probably will continue to have it. It is a rare bird indeed who buys machinery or erects a plant and lays it away on ice against a future day. Andrew Carnegie was one of that rare species but he seemed to be about the only one in the steel business. In any other business they seem equally rare.

I wonder how many men in this room can be induced to buy machinery on the sole argument that the time to buy is when costs are low, and builders can make prompt deliveries, and are willing to sacrifice profits to hold an organization together. Generally that argument will not coax a teaspoonful of business out of a man whose plant is not running quite full up to capacity. Nearly all manufacturers buy machinery only if and when they think they are going to be able to use it rather promptly in producing goods at a profit. If that happens to be when business is dull in the equipment industries, a shrewd buyer can perhaps pick up some equipment bargains. But he is not buying because of low prices, but because of actual need of the machinery. If the people who buy a manufacturer's goods have the spurt habit of buying, then that manufacturer necessarily gets the spurt habit of buying the machines he needs to fill his spurt of orders. So, too, if merchants get into steadier buying habits, the manufacturers of all kinds of goods will steady their own habits of buying machinery. Whenever general business took a booming spurt they came at the machine builders in droves, clamoring for deliveries day before yesterday. Then at the first signs of slackening business they dropped out of the market for the simple reason that their wants were temporarily satiated. So with very few exceptions buyers of machinery are Simon Pure, dyed-in-the-wool, hand-to-mouth buyers.

No class of industry can be helped more than the equipment industries by stabilization of general buying. Industrial machines cannot safely be stocked in dull times, because any competitor may come out with a new and revolutionary design that simply turns all stocks of previous designs into scrap. So these industries have always had to go through the painful, wasteful and costly process of curtailing their labor forces when their demand fell off. This was always just about when

Address presented before the Metropolitan Life Group Policy Holders' Conference, Chicago, Feb. 17, 1927.

the force had been painfully trained and licked into shape at great cost. Every single trouble of any other equipment industry is present in magnified form in the machine tool industry. This is because our industry makes the equipment for all the other equipment industries, beside furnishing equipment to the manufacturers of all consumer goods that have parts made of metal, from abacuses to zithers.

The recent comparative stabilization of consumer goods buying has had some very marked effects on the machine tool industry. Instead of a fairly high boom following the big slump of 1921 and early 1922, the year 1923 brought only a very little boomlet that did not reach much if any above 45 to 50 per cent of the industry's capacity as a whole. Then what was only a slight recession in 1924 for other industries was a fairish slumplet in the machine tool field; 1925 and 1926 pushed the industry's orders above the boomlet of 1923, making an average utilization of plant probably around 60 or 65 per cent of one-shift capacity. Since the present capacity is the result of a heavy war-time expansion, that would be a rather good pre-war business. But overburdened with this extra capacity that it must carry for some years more, the industry as a whole has not been a happy hunting ground in which to get anything like the bag of profits that other industries have furnished.

50 to 400 Per Cent Return on Investment

In the vain attempt to coax out enough business to utilize this large capacity, new designs are offered at prices that leave but little profit to the builder, although they earn from 100 per cent to 400 per cent on their cost each year in the user's shop. Some tools that are better protected by patents, and are sold by better merchandisers are priced so high that they pay only 50 per cent dividends a year to their users.

Curiously enough some users have gotten to refuse to buy machines that do not pay 100 per cent or more per year on the investment. Recently one of this class refused to install a battery that would pay only 50 per cent a year. As the machines were not to be gotten anywhere else, the president of that user company is depriving his stockholders of a chance to earn money by investing a part of their surplus, which he is kindly holding for them in gilt edge bonds that pay about 4½ per cent. This particular company's factories are full of obsolete machines that should properly be shown on the books as a liability instead of an asset. Its president, however, wonders how a competing concern can possibly show the earnings it reports; but then the competitor's president bought a large number of the 50 per cent-a-year dividend-paying machines, which the other man thinks are too high priced.

Recent surveys of equipment in machine shops of all sorts have disclosed to us a large number of machine tools that are more than ten years old. Many of these tools are in good running condition, because to do good work when new, they had to be so well built that wear-out is extremely slow. But physical life and economic life are two quite different and unrelated kinds of life. Necessity to get business has again borne a fresh crop of new inventions and development in the machine tool industry. So many superior designs have been brought out in the last five years that mechanical experts agree that nearly every type of machine tool built up to 1921 is now definitely obsolete for fast production. As wide-awake users install the newer types, their less wide-awake competitors must either follow suit or sink into business oblivion.

On this fact basis, the machine tool industry has stepped out of the mire, and while its profits have not been great, due to the burden of excess capacity, it at least has begun to share a little in the general prosperity that its designs have created for its customers. Relatively stable buying of machines will help us more than anything else we know of. But this can be gained by us only after our customers' demand has been stabilized, so we are very glad to do everything possible to urge business men in all other industries to study this problem and learn how to help cure the evils of unnecessary irregularity that have cursed all business in the past.

After a yachtsman has acquired a good pair of sea legs that keep him on his feet on a tossing boat, he finds some trouble in readjusting his gait when he steps on to a solid concrete dock. He may even stagger about so badly that a prim member of the W.C.T.U. would swear in court that the yacht had picked up a contraband liquid cargo somewhere. So I imagine that some perfectly sober business houses have been staggering a bit in somewhat the same way, training very skillful sea legs to walk without staggering on a business gang plank that is considerably more stable than it used to be. There is some difficulty in readjusting the business mind to the feel of more stable demand.

No doubt all of you have heard some men complain that business in the last few years has not been what it ought to be. And if you have had occasion to dig into the facts you have found that for the last four years their average was better than in any four years they ever had in their business lives. True, their plant was probably not fully occupied, because it was a peak-load plant, able to handle a rush of business when it came in a spurt. When their customers insisted on buying in spurts their plant facilities had to match the customers' habit of spurt buying.

Deluded by Orders in Spurts

Then they got to deluding themselves into the idea that business was normal when they had such a spurt of orders as to cause the plant to run at the peak load. Under this delusion they shut their eyes to the cold fact that often the peak load was off, when much of the plant was idle. If they had taken the trouble to figure it out they would have found a surprisingly small average utilization. U. S. Steel's experience was about 60 per cent average production relative to capacity, over a period of many years. As nearly as I can figure, the merchant iron furnace average has been about 50 per cent under the old feast-and-famine conditions. But a spurt is of course very exciting, with extra shifts, overtime, etc., and the monotony of going along steadily at 65 or 70 per cent, makes life quite dull compared to the excitement of a spurt. But it really is more profitable in the end.

Perhaps the relative stability of operations, for some years past, even though it was below peak capacity, may account to a considerable degree for the curious paradox of the lower prices and greater corporation surpluses that we have witnessed in that period.

In time, as conscious study of the problem results in greater stabilization, the unnecessary and less efficient plants and managers in each industry will be squeezed out. The surviving units will be those that equipped themselves with the best plant and personnel, and are

therefore able to meet sound healthy competition of similarly equipped and manned institutions.

It is well known that given good statistics the business analyst can point out many things done by business men in the mass that produce evil effects. So business men generally should pay more careful attention to statistics, to their own pocket book benefit.

They should favor and procure prompt and accurate reporting by business houses to their trade associations. They should procure prompt and accurate compilation by qualified people in the various association offices. They should procure prompt and wide publicity of facts so gathered and compiled. They should give generous support to qualified interpreters of these facts. And finally, business men generally should learn how to apply those valuable facts to their own individual businesses.

Secretary Hoover has repeatedly stated in recent months that the overwhelming weight of evidence proves that the relative stability of business in the last four years is due more to knowledge of facts and the use of that knowledge than to any other factor. Certainly more and more large concerns have been organizing business analysis staffs of their own, which in turn co-operate with the trade associations of their industry.

As more and more business men learn this lesson we shall have better and better, because saner and saner business. Stockholders will have steadier and safer profits, and workmen will have steadier employment and greater purchasing power due to the elimination of the wastes that come from unstable business.

Calculating Metal Quantities for Alloys

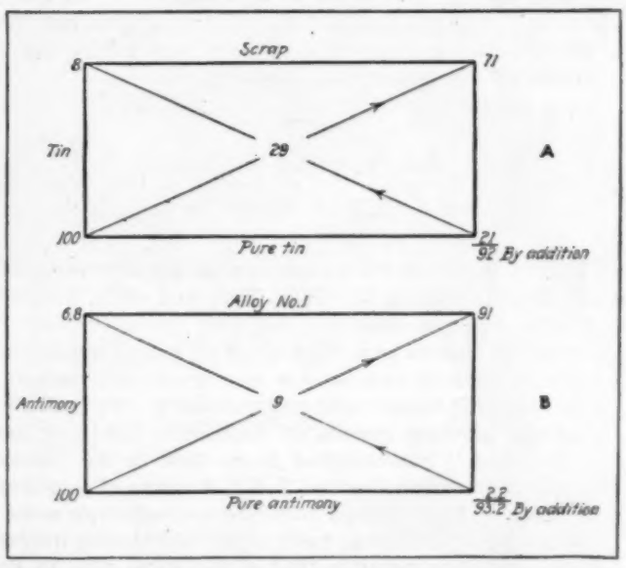
By A. W. Beshgetoor

THIS method is suitable for calculating bearing metal alloys to any desired composition. A practical example will be followed through with one type of alloy, and the ease with which it may be adapted for others can readily be seen.

Suppose that we wish to make up a babbit of the composition: Tin, 28 per cent; lead, 62; antimony, 9; copper, 1. An analysis of a melt of scrap available is as follows: Tin, 8.0 per cent; lead, 8.25; antimony, 8.8; copper, 0.7 per cent.

First, we must bring up the tin and reduce the lead, in this case about 20 per cent of each. This is done by adding pure tin. It is apparent that the antimony, which is about right in the scrap, will be lowered. We will allow for this by calculating our first paper alloy as 29 per cent of tin instead of the desired 28. One per cent is a safe amount to allow for such a correction, which will be absorbed by our second paper alloy.

Place the 29 in the center of a rectangle and draw diagonals as at *A* in the illustration, placing the percentage of tin in the scrap and the percentage of tin of the pure metal or strong alloy on the two left-hand corners. Subtract the smaller from the larger on the diagonals, as shown, placing the answer on the correct corner in each case. Add the two right-hand corners. Thus, 71 lb. of alloy and 21 lb. of pure tin will make 92 lb. of an alloy having 29 per cent of tin.



Diagrams for calculating alloys

This alloy will have the following composition, and is our first paper alloy: Tin, 29.0 per cent; lead, $7\frac{3}{8}$ × 82.5), 63.7; antimony, ($7\frac{1}{2}$ × 8.6), 6.8; copper, ($7\frac{1}{2}$ × 0.7), 0.54 per cent.

We now want to make an alloy containing 9 per cent of antimony by adding pure antimony to our first paper alloy. This time we place the 9 in the center of the receptacle, *B*, the antimony figures on the left-hand corners, and subtract as before. The arrow represents the direction of the subtraction. Thus, 91 lb. of alloy No. 1, and 2.2 lb. of antimony give an alloy of the following composition: Antimony, 9.0 per cent; tin, ($9\frac{1}{3}$.2), 28.3; lead, ($9\frac{3}{8}$ .2), 62.2; copper, ($9\frac{1}{3}$.2), 0.52 per cent.

A third similar computation might be made, but inspection shows that half a pound of copper per 100 lb. will bring the alloy to almost the exact composition desired. If we had 213 lb. of the original alloy, taking the percentages found we melt up the 213 lb. of scrap, 63 lb. of pure tin, 6.6 lb. of pure antimony, and 1.4 lb. of pure copper, and obtain 284 lb. of the desired alloy.

Keeping Life in the Safety Committee

By D. C. Wright

SAFETY committees that hold office for a year usually begin with a flood of recommendations, and then lose their effectiveness. This condition was met by organizing a committee that automatically shifted personnel every month.

From a list of available men thirty-six names were selected, three men to serve as the safety committee for each month in the year. Care was taken that two men from one department would not serve at the same time. The names were posted in advance, and each committee went automatically into existence each month. An inspection of the entire plant was required of the committee before the middle of the month, which gave time for a meeting to be held and a report submitted by the committee before the end of the month. This plan has been in successful operation for several years.

Specifications That Waste Money

BY JOHN R. GODFREY

"GODFREY," said Old Man Johnson the other day, "if I had the money that is wasted because of a lot of fool specifications and ignorant inspection, I'd have Henry Ford backed off the map when it came to paying income taxes.

"Specifications aren't so bad when you are having a machine of your own design built to order. Though even then it's dollars to doughnuts that the man who is going to build it knows as much as you do about the kind of metal to use for shafts and bearings. At any rate, it's a good plan to consult him before you insist on certain brands of steel, because he may know a lot more about it than you do.

"But when it comes to specifying details of a standard machine that you are going to buy—it's plumb foolish in every way. How the heck does a user know what metals to use as well as the builder who has built his reputation on the success of his machines?

"It's this way, Godfrey. Here we get an order for engines. I look it over and find they want our 60-hp. model M— only they call it by another name. But it's our engine just the same—and they all carry a guaranty of performance and workmanship.

"From the specifications, however, you'd think it was a brand new engine of the purchaser's own design. They tell the sizes of parts, kinds of material, tolerances, and even the kind of metal I've got to use in the name plate, and the size of screws to use in fastening it on. Sounds like a joke. I know—but it's a fact.

"Some poor fish has spent a lot of valuable time in going over one of our engines and getting dimensions and details. Then he sticks 'em down on a sheet of paper and calls it a specification.

"The joke is that since we built the engines he's been pawing over, we've made a lot of improvements that we couldn't use if we followed the specifications. Instead of assuring the best of engines it compels the purchaser to take an engine that we've practically abandoned. If we follow specifications he gets an old engine —and so far I haven't been able to tell him a thing. The minute you mention changes he sees visions of profits till he froths at the mouth. It doesn't ever seem to occur to him that a builder just can't afford to give him a poorer job than his regular line. He'd lose money because it adds to the expense to try and change the shop routine.

"Just as a sample of the way he's taken one of our engines and dissected it for specification purposes, listen to this, Godfrey: '— the cooling fan shall have the blades welded to a steel hub.'

"Now what difference does it make just how that fan is made, as long as it sloshes the air around enough to cool the radiator? But here's the joke. The engine the specification shark got hold of had one of a lot of misfit fans that we'd patched up to get 'em out in a hurry. It isn't our regular fan at all—no better or worse, but not standard. But the guy who wrote the specification evidently hasn't any notion of what a fan is for or what makes it work. Now we've got to patch up some fans to suit the inspector or get a 'reject.' Whether they cool or not isn't the question—they've got to have welded joints in the blade or they don't get by.

"The specifications say the valves must be of standard steel—whatever that is. Now we've been using tungsten-chrome steel for the exhaust valves for some time, because it's better—but I've got to get a special dispensation to use it in these engines."

"But you can't blame the inspector, Bill," I ventured.

"Of course not, Godfrey. I'm not. I'm blaming the system that permits such fool specifications to be written and enforced. We're howling a lot about economy—and I'm for it—when it's real. But when you let men write specifications about machines that are as strange to them as chop-suey is said to be to a Chinaman, and demand their enforcement by men with no knowledge and no horse sense—it's deuced expensive economy.

"I had an inspector during the war who was a peach. He came to me the first day and said, 'Mr. Johnson, I'm here because it's my job. I don't belong in an engine shop because I don't know a d—— thing about 'em except to cuss when they don't run. I'm a corset manufacturer and I ought to be in some textile mill. I've looked up your reputation and it's good. I know you want to give us good engines. And I'm not going to display my ignorance by objecting to items I don't know a d—— thing about. I want a record of the test of each engine—that's what counts—and if they test O.K., they pass.'

"Say, Godfrey—do you think he got good engines? You know damned well he did! I passed word down the line that we had an inspector who believed we were honest and could build good engines—that it was up to us to give him the very best of everything. Every man of 'em would work his head off for that inspector—and he got the best lot of engines we ever turned out."

"And how do you buy machine equipment, Bill?" I asked him. "Don't you have some specifications?"

"Sure, John—but they don't deal with such details as nameplates. I specify performance over a given period. I only buy from people with a reputation to keep and live up to. I demand certain standards for work and tool holding fixtures so that I can shift chucks and fixtures from one machine to another.

"When I buy a machine that another man has developed, and built up a reputation on—I don't care about details. I buy results—and if I don't get 'em there's trouble. And you bet I don't throw any fool specifications in his way that prevent him from giving me the results of his latest ideas and experience."

An Appeal for Ideas

BY W. G. GRIFFITHS

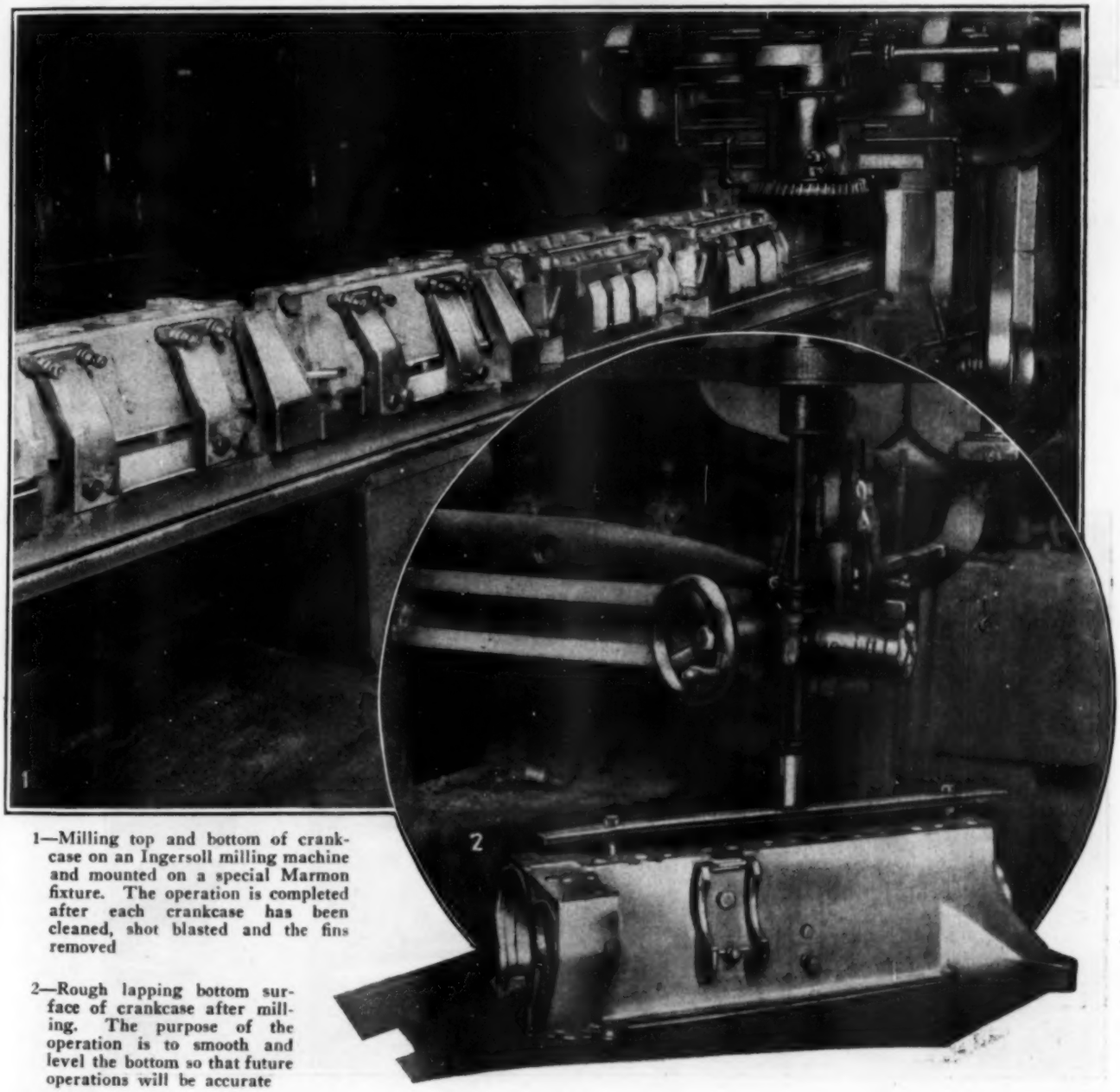
Central Y.M.C.A., Cardiff, Wales

THIS is an appeal to readers of the *American Machinist*. During the Great War, and since, a number of new schemes and methods for raising money for charitable objects have been adopted, but all good things come to an end, and in this country at any rate it is difficult to hit on new and original plans. We hear from America glowing stories of successful lightning campaigns, and it has occurred to me that in the interests of an organization like the Y.M.C.A. some of your readers may be kind enough to write me outlining some of these efforts. Different parts of the world have different ideas, and it is possible that a well-worn plan in your country may be quite new here.

Automotive Production

Marmon Crankcase Methods

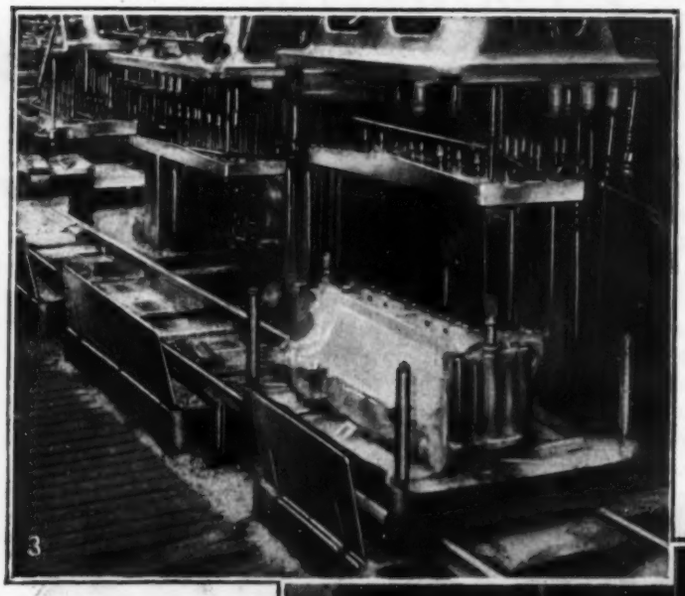
SECURING an oil tight joint between the crankcase and the oil pan without distorting the crankcase by bolting the parts together, requires care in having both surfaces as flat as is commercially practicable. Then, too, a truly flat surface on the under side of the crankcase helps in securing good alignment of the crankshaft bearing seats in the crankcase itself. The importance attached to this part of the work by the Marmon Automobile Co. is shown by the care taken in machining and lapping the flat surfaces of the crankcase. There are two lapping operations, the last one being of special interest on account of the movement given to the crankcase.



1—Milling top and bottom of crankcase on an Ingersoll milling machine and mounted on a special Marmon fixture. The operation is completed after each crankcase has been cleaned, shot blasted and the fins removed

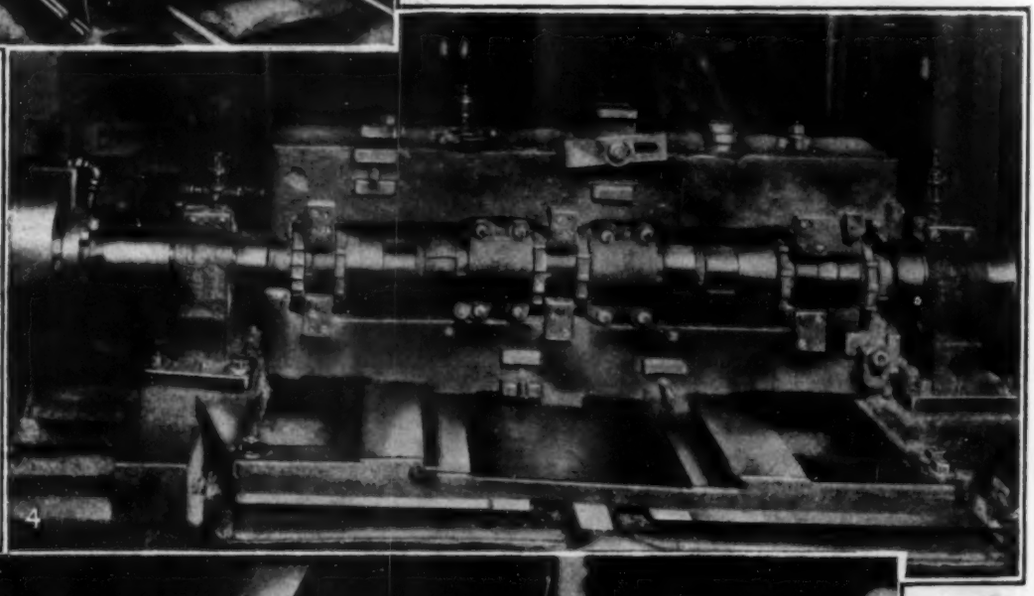
2—Rough lapping bottom surface of crankcase after milling. The purpose of the operation is to smooth and level the bottom so that future operations will be accurate

Automotive Production

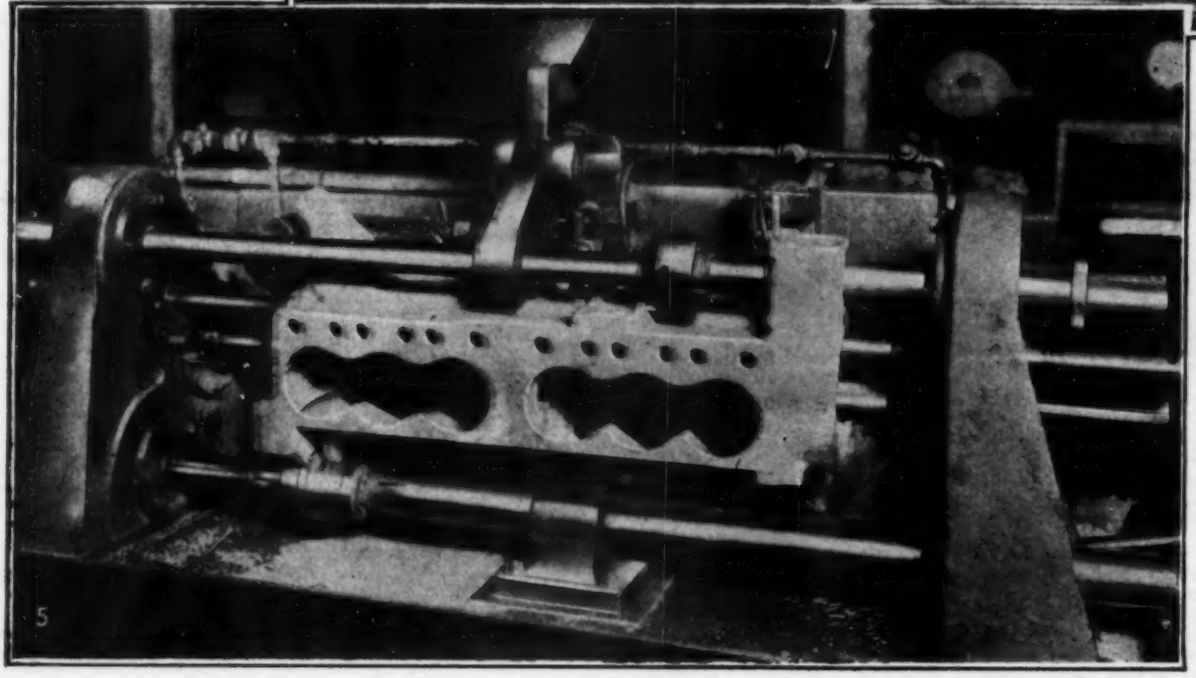


3—Multiple drill presses that drill and ream holes in the crankcase for bolts, valve tappet guides, studs, and so forth

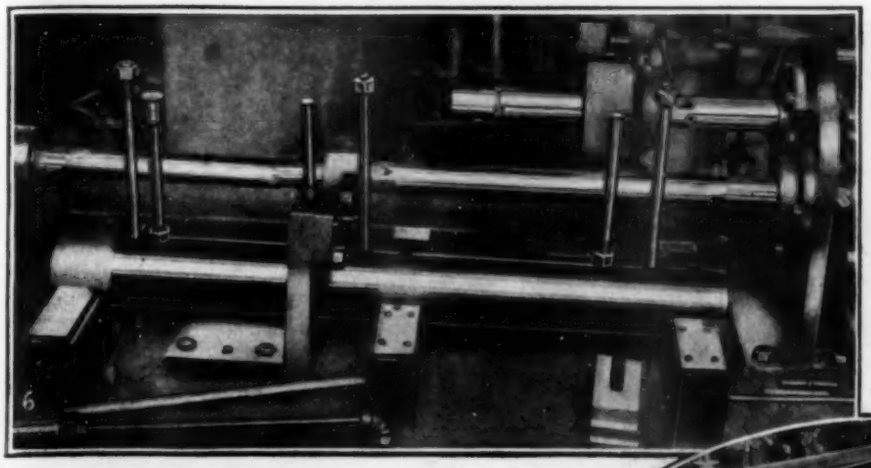
4—Chard lathe equipped with special Marmon fixture for machining sides of main-bearing seats



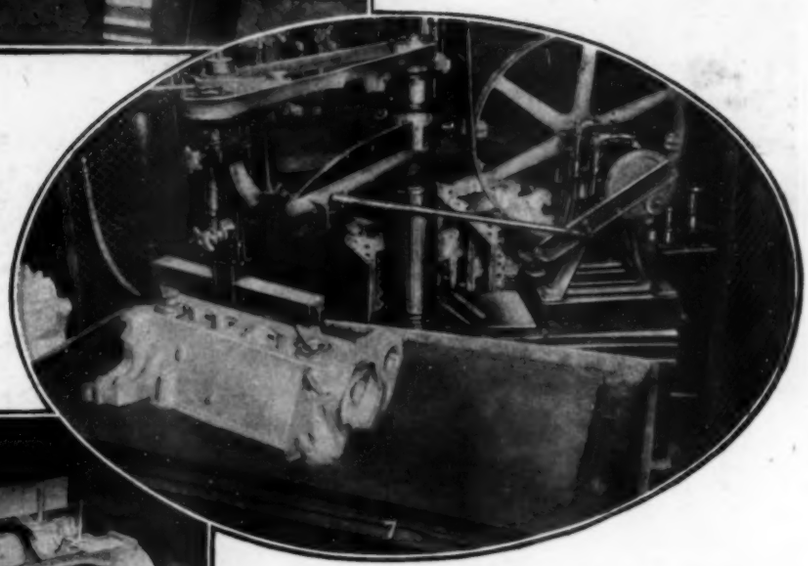
5—Final process in cutting bearing seats, generator housing pad, and starter cradle in crankcase. The machine is of Marmon design, using diamond boring tools, and does all operations simultaneously



Automotive Production

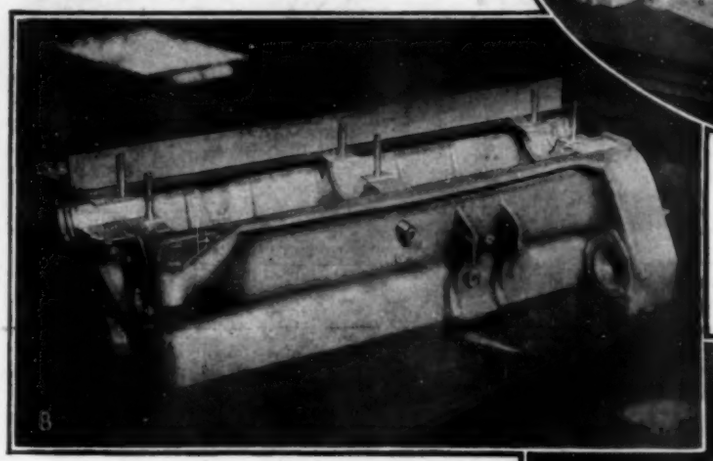


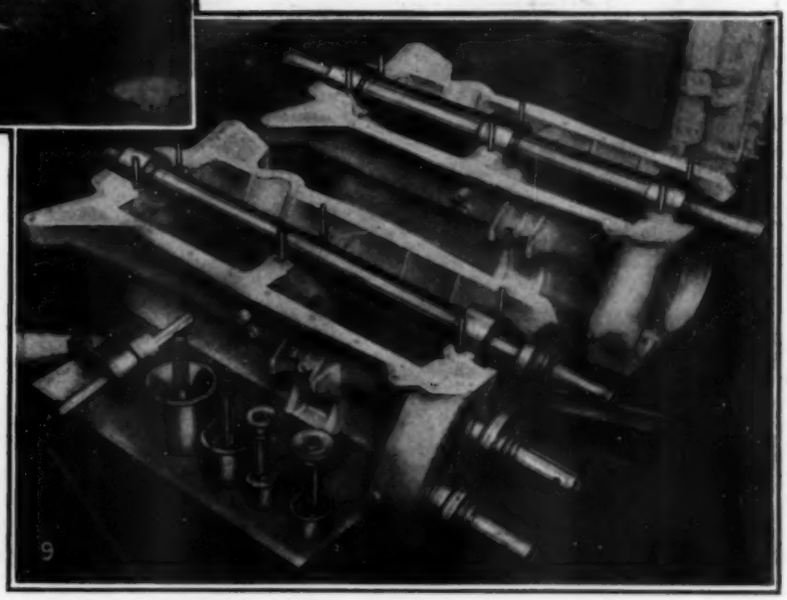
6—Machine for hand flycutting three camshaft-bearing holes and generator-bearing holes. This machine is also of Marmon design



7—Final crankcase lapping operation. The machine shown laps the bottom of the crankcase to a final smoothness, so that an oil-tight joint may be made between the crankcase and the oil base. The crankcase is given a combined rotary and side movement

8—Testing bottom surface of crankcase after final lapping operation with a straight-edge gage. The surface must be parallel within three-thousandths of an inch





9—Testing alignment of bearing seats and testing center distances of main-bearing seat, camshaft-bearing hole and accessory-shaft bearing hole. The exactness of these tests accounts for the silent and smooth operation of Marmon timing gears. Each bearing must be in alignment with the other two. Other gages are used for the inspection of various holes in the crankcase

Automotive Production

Care in Assembling

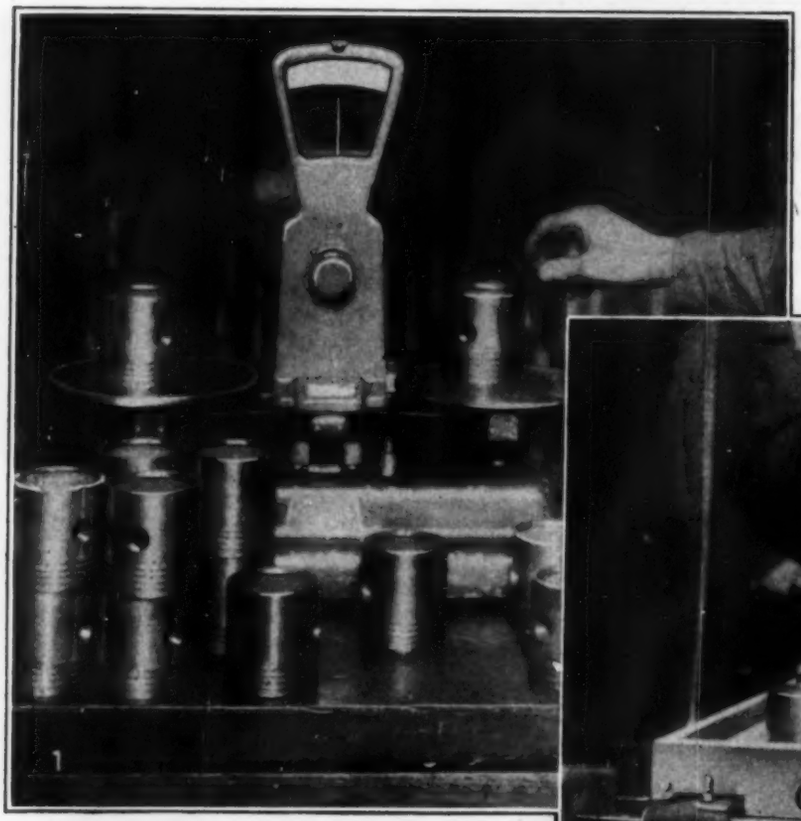


Fig. 1—Weighing pistons to secure uniform weight in each cylinder of an engine

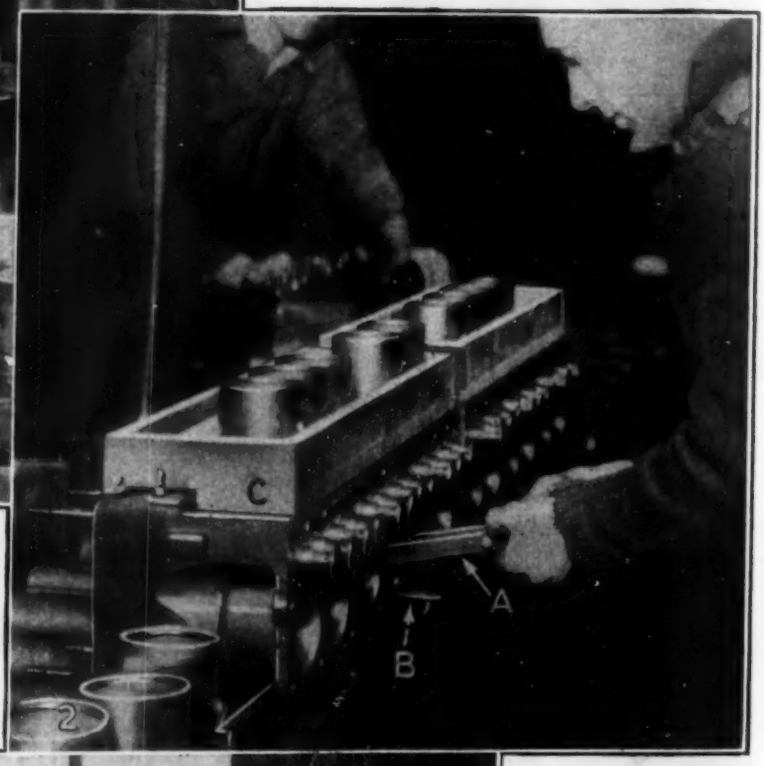
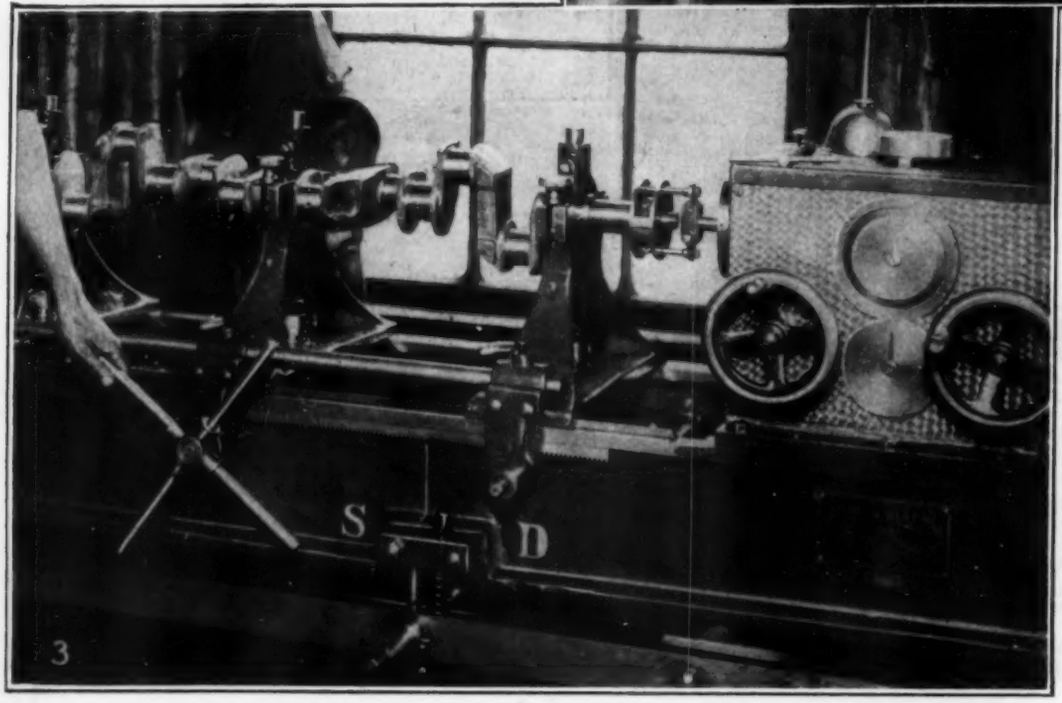


Fig. 2—Selecting pistons to give desired clearance in cylinder bore. Clamp *A* has projections that fit into piston pin holes. A steel strip *B* is laid in cylinder and measures the clearance of from 0.0015 to 0.002 in. Pistons are handled in trays that fit on side of block as at *C*

Fig. 3—Crankshafts are balanced on the Olsen machine shown. Shaft has five bearings and is supported at three points



Automotive Production

Lycoming Engines

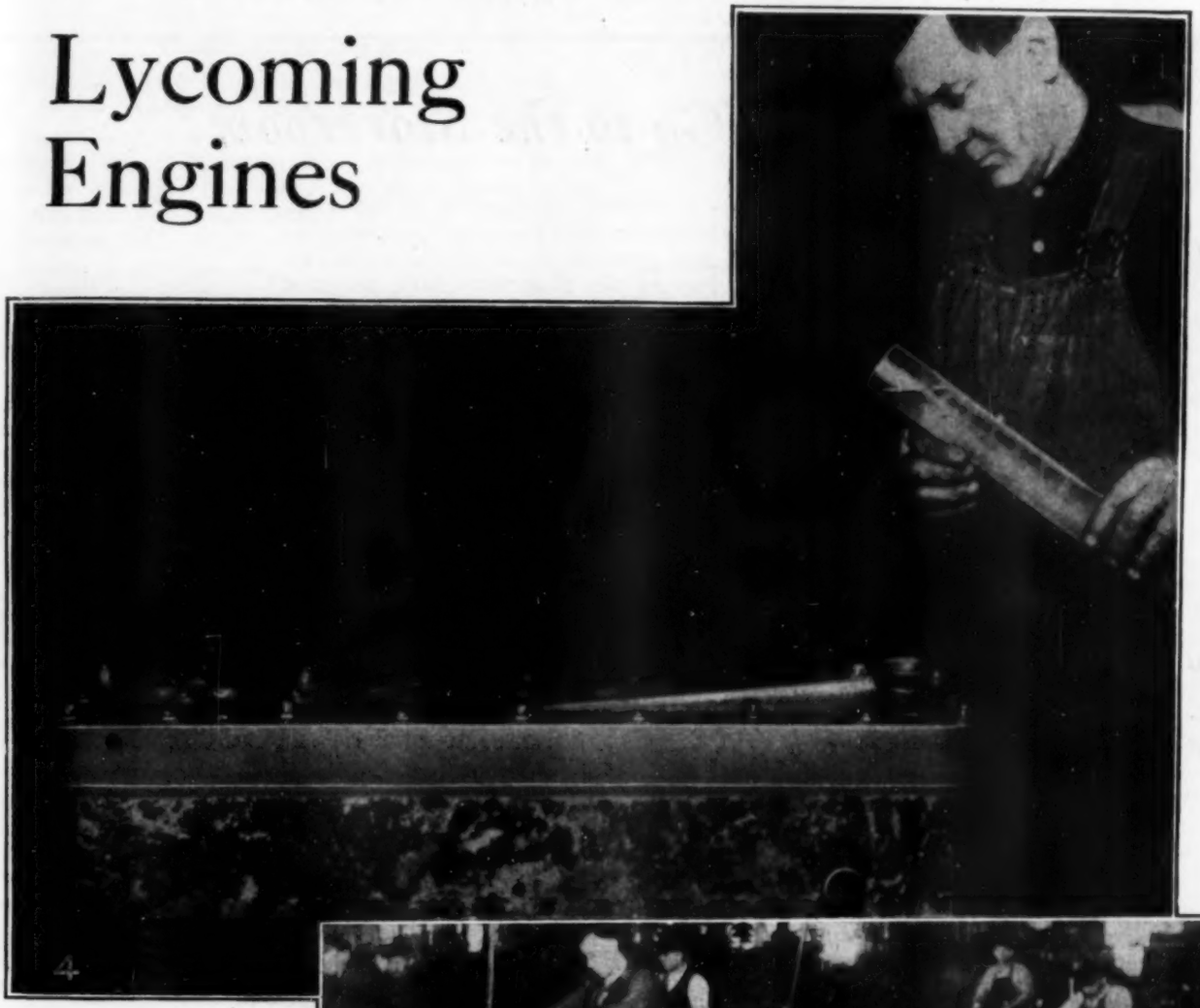


Fig. 4—Testing volume of combustion chamber in cylinder head. Head is bolted down on a flat plate with a gasket in place. The amount of liquid necessary to fill each chamber through its spark plug hole, tests the volume accurately and quickly. Using the standard gasket gives volume of head assembled to engine

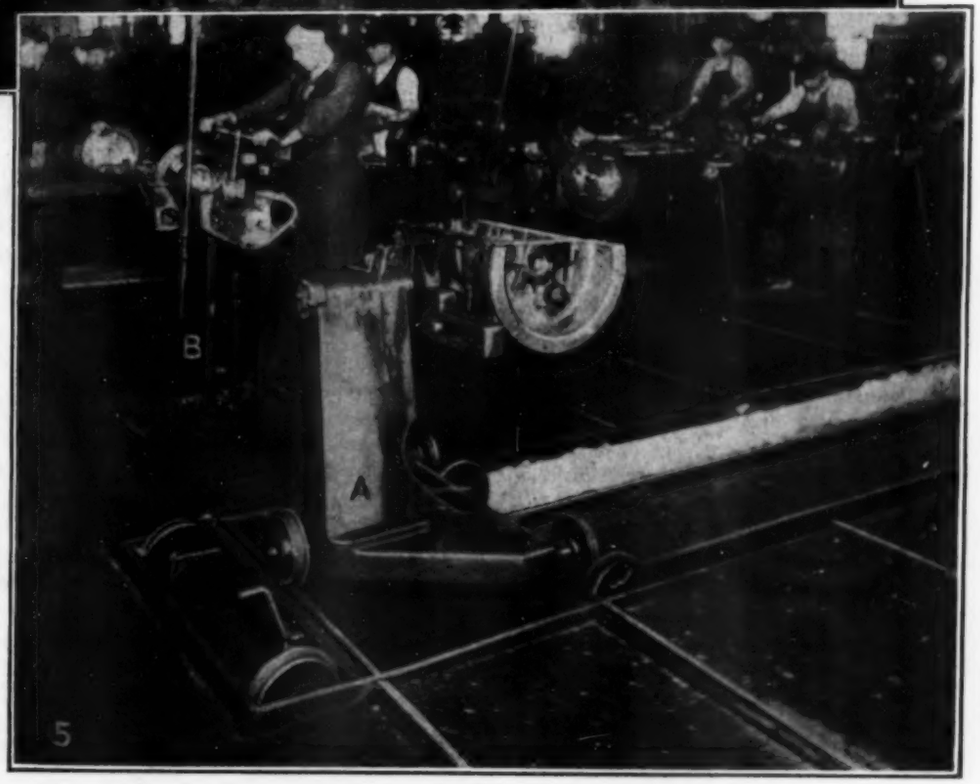


Fig. 5—Corner of assembling department. Assembling stands, as *A*, are mounted on three wheels and move on tracks from one assembler to the next. The transfer table carries the stand to any desired track. This makes a very flexible assembly layout as the lines can be varied to suit the type of engine going through the plant

THE · FOREMAN'S · ROUND · TABLE

Who Should Go to the Storeroom?

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"YOU know, Ed, I don't think they're exactly asleep over there at Carrigan's."

"What's on your mind, now, Al? The only progressive thing I ever knew old man Carrigan to do was to send his boy out with a wad of money for expenses and tell him not to come back until he'd been in all the worthwhile shops in the country, big and little."

"That's the point exactly, and I've got a hunch that the traveling expenses are going to pay big dividends."

"I know what you're thinking about, Al—that employment system where a foreman can't fire his own men so they'll stay fired."

"Yes, that for one thing. But I've been over there several times recently and I've seen a number of things that have opened my eyes. Over there, for example, you simply don't see high-priced workmen moving around the shop."

"But how do the assemblers get their parts from the storeroom? And what does a machine man do when his tools get dull, and when he needs something from the toolroom?"

"The whole thing is under the storekeeper, Ed. He has what he calls runners, who collect requisitions, tool checks, and orders from the shop departments and deliver what's called for. The requisition stations are located on top of fixed screened cages that have padlocks. Delivered parts of value are locked up, and only the runner and the foreman have keys. Other parts are placed on top of the cage or on the floor near it."

"When a fellow wants a reamer, for example, he writes a memo telling the size, and so on, attaches his tool check and puts it into the requisition station. Same way with parts to go on a machine. Course that means looking way ahead, but after all looking ahead is nothing but good planning. Then all the tools have to be ground in the toolroom—a good system to my way of thinking. The runners use shoulder bags, push carts, and storage-battery trucks, and they keep up a schedule. A man can send an apprentice on an errand in case of emergency, but it's up to the foreman to see that emergencies don't often arise."

"And is that one of Frank's ideas? Where did he get it?"

"It is, and he says he got it in a Pacific Coast railroad shop. What do you think of it?"

"Looks good to me, Al. Tell us another one."

Do results, as a rule, justify the expense incurred in sending foremen and other executives to other plants?

Will the scheme used at Carrigan's work in all shops? In what type of shop is it of most value?

Doesn't such a system increase the foreman's opportunities for planning and for constructive leadership?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Getting to the Big Boss

THE average workman having a grievance, be it real or imaginary, must simply get it off his chest if he is to continue to produce to his fullest capacity. It is really an important management problem to make this possible quickly. The easiest and most practical way to give him this opportunity is to create a "personnel superintendent." He should be made accessible to the workman at all times and should be the channel through which the men approach the "big boss."

Many grievances, particularly imaginary ones, solve themselves in the mere telling of them. An intelligent and keen personnel man can often get the workman to talk himself out and get all the satisfaction he really craves in the mere process of airing it. If he can sincerely convince the men that he is honestly interested in them and in their problems he is worth every bit of his salary for this function alone. If the company does not possess a personnel superintendent, I would suggest that a shop committee be elected by the men to serve as the intermediary between the men and the "big boss." In the case of the foreman and the superintendent the situation is somewhat different. A request on the part of a foreman for permission to take a grievance to the "big boss" may be reasonably expected to be frankly granted.

—WM. H. DONNER.

Who Should Keep Machines Oiled?

FIVE years ago I was given charge of a large department with about 150 machines, including power presses, drilling machines and others, and it was a common sight to see one or two machines broken down because of frozen bearings. The cause was the periodical changing of oilers, giving the job to untrained laborers or letting the operators oil up before starting the machines.

My first step was to get all the bearings equipped with self-feeding grease cups or, where necessary, oil cups. Another step that I took was to get the best grease and oil obtainable. Then I took one of my oldest and best employees into my confidence and got him to come one hour earlier in the morning and to take but a half hour for lunch so that he could spend the other half hour oiling wherever necessary. Saturday afternoons he would fill up all the grease cups where it was not necessary to do so during the week and fill up all gear cases with cylinder oil.

The result is that in the past five years we have had no frozen flywheels, nor any hot bearings on any of the machines. The man is satisfied since he takes the job seriously and makes extra money through the overtime that he works. In my opinion it is safer and more practical to hold one or two men responsible for the oiling. The oiler should be a steady man, willing to make extra money and should be, preferably, married.

JOS. L. MIHOLICH, *Foreman.*

Helping Your Men Get Better Jobs

AT ONE time I worked for a foreman in a railroad shop, who had a man operating a big slotter. This operator was so much more satisfactory on the machine than any of his predecessors that the foreman would never shift him although frequently requested to do so by the operator who was a first-class all-around mechanic. He was always told that he was doing all right where he was. Later the shop superintendent wanted a chargehand and asked that the slotting machine operator be given a chance since he had noticed the man's ability. Then a great "squeal" went up that the man couldn't be replaced. However, the shop superintendent was insistent and the man got the promotion and also quickly developed a substitute who successfully handled his former job. This was but the first of several promotions that he has had since, but he would still be running the slotter if the old foreman had his way.

Yes, I would and have helped my men get better jobs, either with other firms or with our own, no matter how it may have inconvenienced me temporarily. Although at times I have been badly handicapped by the loss of a good man I have yet to regret the assistance given to one of these men.

—BILL BROWN, *Superintendent.*

Getting Men to Observe Safety Rules

IN FIXING the responsibility for personal injuries incurred in a plant, there are many factors to be considered. Has the management done its full duty in providing safety devices at all dangerous points and conducted a course on safety first and first aid? Has the foreman enforced all safety rules and kept the machine guards in proper order? Has he seen to it that these guards were properly used?

As I see it, safety first is a three-fold responsibility involving the management, the foreman and the men. The management should have a sense of duty and responsibility to the foreman and to the men in its employ. The foreman should have a sense of loyalty to the management that looks to him for the enforcement of its rules as well as a sense of duty to the men who are under his direction. The men should be loyal

THE · NEXT · TOPIC

Is the Repetitive Operation to Be Avoided?

QUESTIONS

Should the foreman make a study of the truths concerning repetitive operations? Why?

Is it advisable to shift men from repetitive jobs to those requiring concentration and skill, and vice versa?

to the management and to the foreman and should feel a responsibility to themselves and to their families. Any laxity in the fundamental laws of safety by any of the parties concerned is an infringement of the rights and the safety of others. GEO. R. MILLER, *Canada.*

Getting Men to Observe Safety Rules

A COURSE of twelve or more lectures on first aid, given in the lunch room annually by a doctor, proves valuable in obtaining an understanding of safety and the handling of accidents. It is especially valuable if the lecturer will quote accidents which have occurred in the neighborhood and where the men are familiar with the case cited.

One case mentioned at a lecture of this kind was that of a man who was using a pen knife to cut some of his food. He accidentally dropped it and to prevent its going on the floor he closed his knees together. The knife fell point down and cut the main artery in his thigh. He would have bled to death before the doctor arrived were it not for the first-aid knowledge of the man sitting next to him.

Such lectures make a profound impression and serve as a warning as well as giving valuable information. Silly things are done every day and much depends on the watchfulness of the foreman. Habitually foolish men should be discharged since they are endangering the lives of others. —H. MAPLETHORPE, *England.*

Making Good Workmen Out of Poor Prospects

A FOREMAN should know the worth of his workmen, and if he finds that one of them is doing good work for inferior pay it would be a wise act to give that man a raise before he has to beg for it. It would give the man the impression that his foreman is interested in his welfare and inspire him to even better work.

Al must have been a student of human nature to do what he did for Schimmel. In quite a number of cases the writer is afraid that a man like the one under observation would be turned down; his personality is not very appealing, and he would not get a chance to show of what stuff he was made. It would be fairer to the man to let him know that he was unsuited to his job but should he show promise in any particular direction it would pay to give him a chance to make good.

—NEWTON E. GEOFFRY, *England.*

Getting Men to Observe Safety Rules

SAFETY campaigns are useless unless every endeavor has been made to properly and adequately guard all machines. I know a shop, personally, that is plastered with a liberal supply of "safety first" posters where there has been no great endeavor to provide the proper equipment for guarding the machines. There are many instances where the guards provided do not protect the workers. This same shop, on the other hand, does not hesitate to stop a whole length of shafting which may serve to drive from twenty to thirty machines, to put on a belt that is an inch and a half wide.

This is carrying the safety campaign too far in some extremes and not far enough in other essentials. A properly designed belt stick will permit the changing of much larger belts in perfect safety. It is the duty of all foremen to see that the safety rules are observed and that the machines are properly guarded. Proper guards form the primary requirement for safety to the workman. —JAMES C. HARPER, *Scotland.*

Getting Men to Observe Safety Rules

HUMAN safety in an industrial plant is a factor of outstanding importance. Each shop should have a safety organization with a responsible head and assistants from every corner of the plant, each individual having specific responsibilities and a definite time and place to report. The chairman should keep informed of the most successful safety methods used in the country and adapt the best ones to the needs of his plant.

Unsafe and careless practices are costly to both the employer and the employee and these characteristics in men should be just as much considered as their skill and adaptability. The foreman should to some extent accept the responsibility for the carrying out of safe methods in his department in addition to the work of the safety department. —JOHN MARK MAY.

The Practical Joker

I CANNOT see a single desirable feature about a practical joker in the shop, unless it is that this trait so quickly identifies the individual as a logical candidate for the next lay-off. I have all respect for the humorist in the shop, since a man who is really humorous helps to build up the morale of a shop, and rids many a man of a grouch. But a practical joke, so called, is neither humor nor a sign of good sportsmanship.

In the excitement of their abnormal activity, the jokers lose all sense of proportion, and are really dangerous. I know of some instances where death was the consequence. Of course, they don't intend it so but, like the man with the gun, they never realize that their joke may be loaded. There is really only one time to break it up, and that's the first time. The next time may be too late. —GEORGE NEILL.

Getting to the Big Boss

IF THE men are allowed to go over the heads of the foremen and get to the superintendent any time they think they have a grievance, there is going to be very little discipline in the shop, and the superintendent is going to find himself tied down to detail work. In our plant we have a third party who is known as the Manager of Industrial Relations, and the plan seems to work well. —THOMAS M. GARRY, *Foreman.*

More About Discipline in the Shop

DISCIPLINE is necessary in any shop. Such characters as the "cocky" Bill Jones are frequently met with. I remember one such man who worked in the erecting shops setting valves. This man, when he wanted to be, was a producer who "knew his stuff." He was as "cocky" as Bill Jones and at times it was almost impossible to get along with him. He thought that if he

did not set the valves all the engines on the line would be limping.

He was finally transferred to another place where he had plenty of hard work to do. He sulked for a time but finally made up his mind that he was at fault. He is now back at his old job and the atmosphere is much pleasanter. A man who creates an unpleasant atmosphere not only makes it disagreeable for himself but also for his fellow workers. Discipline is the only thing I know of to cure this condition.

—ARTHUR SUTTON, *Foreman.*

Shop Visiting for the Foreman

THERE is one point that Ed missed about his shop visiting, and that is that perhaps Williams wanted to see if his shop would still function smoothly while he was away. Ed ought to learn some new points on the trip, but the "super" will also learn whether Ed has bound himself up with so many shop details that everything will get tangled up when he is away for three days, or whether he has organized his department for smooth operation. —G. B. STUART.

Why They Decided Not To Use a Jig

SURELY Al was too easily persuaded by Jack. If there were only 150 pieces one jig would be enough, and it could be designed to bolt down to the machine table, which would obviate the lifting difficulty. As for prick punching from a templet, it would be easy for the templet to shift, also the drill would need drawing to the punch marks, which is wasting time and leaving the accuracy of the job entirely to the driller.

—R. P. HALL, *England.*

Shop Visiting for the Foreman

IF WILLIAMS expects that his foremen will come back each time from shop visiting with some definite ideas to save money or increase production immediately, he is likely to be disappointed. Occasionally they will, but the chief result will be a broadening of viewpoint, and an addition to the background of knowledge and experience by observation to be used when the necessity or opportunity arises. It is likely to make Ed a better mechanic. He will surely broaden out as a foreman. —C. P. BLOOMER.

Making Good Workmen Out of Poor Prospects

YES, I believe Al was wise in raising Schimmel's pay voluntarily. Fundamentally, a man in a shop should be paid in proportion to the results he produces. In view of the fact that Schimmel was producing greater results than he was being paid for it was only fair to raise his pay. A deserved voluntary raise is the best insurance in the world for the foreman's future with all his men.

There is no denying that good personal appearance and a pleasant disposition aid a man greatly and the man that is without them is greatly handicapped although not barred from winning his way to success. To develop unpromising men or boys does pay. To whip unpromising material into shape is a true criterion of the success of the foreman and it is also a guarantee of loyalty. Just as far as he is not costing his firm hard cash for his experiments in human engineering just so far should a foreman go in developing his men.

—FRANK M. LUOHY.

More About Discipline in the Shop

AL'S plan is a good one, but it is only workable with men of the temperament of Bill Jones. There are such men in every shop, but there are others with more independence, backed up with better technical training and higher abilities, who would not for a moment tolerate such treatment. However, when a man thinks that no one else can do his job, then it is time to apply Al's plan. H. MAPLETHORPE, *England.*

Cutting Down Spoiled Work

WE HAVE just started in our plant a system of practically illustrating to the men the seriousness of the spoiled work account, and of the volume of spoiled work in proportion to each individual. Each month after the scrap charges have been computed the amount of money lost to the department is divided by the number of men employed, which gives the scrap in dollars and cents charged to each employee. This is then posted on a chart in each department.

Keeping this scrap account prominently posted before the men gets their concentrated effort to reduce the figures to the lowest possible amount. This is along the line of Al's idea, except that we pro-rate the amount to each individual employee.

—CHARLES H. ALLEN, *Foreman.*

Getting to the Big Boss

THE workman should be heard without bias, and the condition remedied if possible. If the grievance is only a fancied one every effort should be made to dissuade the workman from the idea that he is ill-used; for a man with a grievance is not contented, and the best work is done by contented men.

Few things are more aggravating to a workman who feels that injustice is being done him than to have the foreman listen with an irritating smile, which means nothing but: "What are you going to do about it?"

The superintendent should be ready to listen to just complaints from the men, the only preliminary being to ask: "Have you taken this matter up with your foreman?" The judgment need not be given to the man at the time, but he can be told that the matter will receive full consideration. —V. E. ATWELL.

More About Discipline in the Shop

A METHOD we employ, if a man gets out of hand, is to lay him off for a day or two, and in the meantime see that his work is done even if it means a little extra cost. No man can afford to lose time, and it certainly gets it out of his head that he is indispensable, and makes him realize that he only assists and does not run the shop.

Al's method may work in some cases, but a man's vanity requires very tactful handling, and it may possibly be the means of losing a good worker for the company, but in either case a risk must be taken, and only knowing the man can possibly indicate the kind of discipline to be used. —NORMAN UCKEY, *England.*

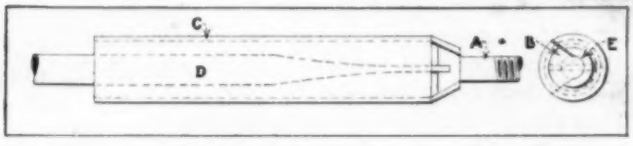
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Wood-Screw Holder

By R. Senay

The screwdriver is not a safe tool. At least, this statement holds true when the tool is used by inexperienced mechanics employed to do simple assembling work. The remedy is simple. It consists in keeping



Holder for wood screws

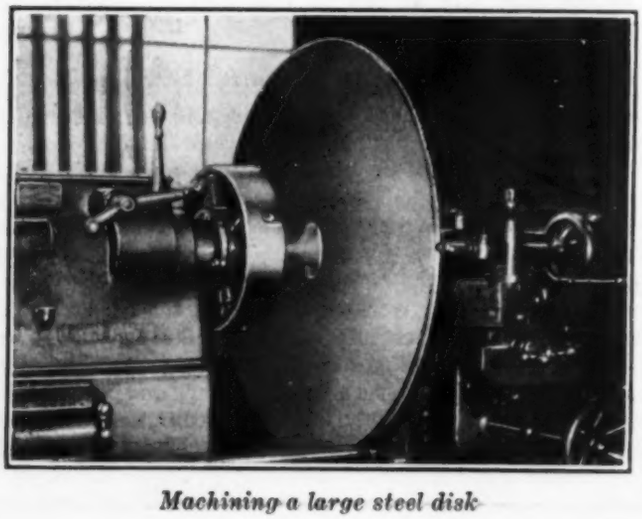
the fingers away from the screw or the end of the tool.

The sleeve shown above holds the screw in place. By placing the screw *A* in the open slot *B* of the metal tube *C* and pressing the screwdriver *D* in the screw slot, the part *E* holds the screw in position. We have found that this inexpensive device speeds up production and reduces injuries.

Economy in Parts of Welded Steel

By A. F. Davis

Large, thin parts made in gray-iron castings frequently give trouble when they reach the machine shop, due to the fact that the finished surfaces do not clean up properly on account of sand spots. The illustration shows in the lathe a 48-in. disk for the top of a revolving table used on automatic arc welders. It is made of a steel plate and is welded to a spindle of cold-drawn shafting. The top surface of the table must be clean and true. With the welded steel construction it was necessary to leave only $\frac{1}{8}$ in. for finish.



Machining a large steel disk

For the purpose steel offers an additional advantage, due to the fact that the table tops receive very rough usage, and that steel will bend rather than break. In case of accident, the steel table would merely have to be straightened, while if the table were made of cast iron, a new one would have to be made.

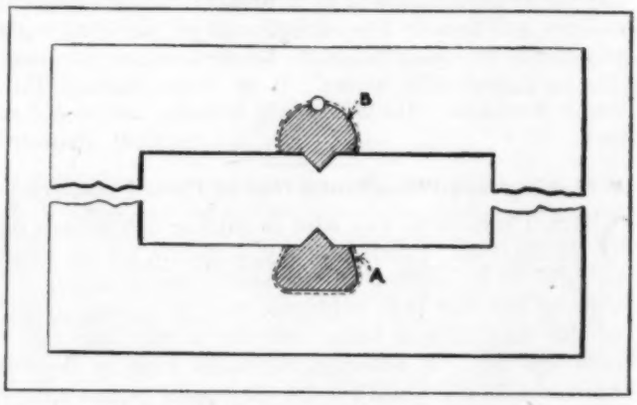
Designing Dies to Decrease Maintenance Cost—Discussion

By Charles Kugler

The article by Lloyd L. Lee under the title given above and published on page 1038, Vol. 65, of the *American Machinist*, interested me very much, partly because there is a less expensive way of putting the inserted piece in the die.

If the piece is put in as shown at *A* in the accompanying sketch—which is practically the method outlined by Mr. Lee—the fitting must be done by filing, and if no filing machine is available the cost of the hand work is too great.

Whenever conditions will permit, I put in such an insert in the manner indicated at *B* in the sketch. I drill and taper ream a hole in the die, and then turn a



Two methods of making an insert

tapered plug to fit it. This method eliminates all hand fitting, and the fit of the plug is more nearly perfect than that of any hand-fitted plug.

To prevent the plug from turning in the die, I drill a small hole along one side, half in the plug and half in the die, and drive in a dowel pin as shown.

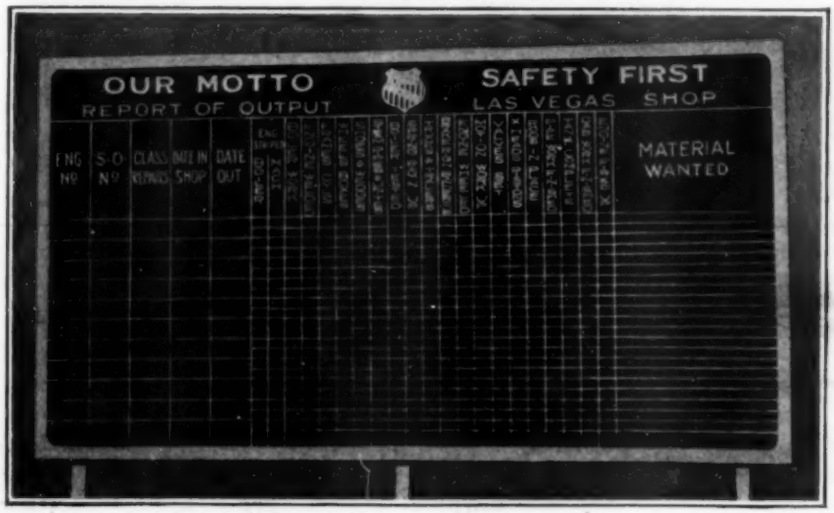
I always heat a die so treated to about 450 deg. F. before putting in the inserted piece. This makes it a shrink fit.

A Work Board for Locomotive Repairs

By J. Madden

Simplicity characterizes the work board for locomotive repairs illustrated. The board is in use in the Las Vegas, Nev., shops of the Union Pacific System.

When an engine is received, its number is placed on the board and opposite the number are chalked up the shop order number, class of repairs, date received and date the engine is expected out. The dates by which the engine is expected to be stripped for boiler and machine work also are marked.



Work board for locomotive repairs

Work to be done is, of course, classified, and the dates for completion of the work in the various departments are marked in chalk on the board under the proper department headings in the upper of the two spaces. As the work in a given department is completed, the date originally specified is crossed off, and the actual date of completion is marked in the lower space. As the men find that they need material, they make note of it in the column "Material Wanted." The foremen see that the material is supplied, and when it has actually reached the floor, erase the notations.

The other headings listed on the board are: Boiler work, engine welded, frames and cylinders, wheels and boxes, shoes and wedges, steam pipes and units, boiler tested, spring rigging up, trucks and trailers, brake-rigging binders up, engine wheeled, motion work up, valves set, crossheads and pistons, rods in place, pipe work finished, tank complete, cab work finished, engine fired up.

Care in Babbitting Bearings —Discussion

By Geo. R. Miller

While the article by M. R. Armstrong under the title given above, and published on page 876, Vol. 65 of the *American Machinist*, is ably written, I would like to take a few exceptions as to some of the statements contained therein.

It is all very well to talk about electric heating pots with the heat automatically controlled, providing the conditions are such that the work can all be brought to a central station to be done, as I imagine is the case on the street railway to which Mr. Armstrong refers, and as can be done in manufacturing establishments.

I will venture the assertion, however, that not 30 per cent of the babbitt used is poured under these conditions, but is used in repair work where it would not be practical to bring the work to a central station or to go to the expense of the equipment referred to. I have poured large bearings where the only heating equipment available was a pile of wood and a few bricks, and in most repair jobs the men handling the babbitt would not know a pyrometer from a clinical thermometer. Yet under these adverse conditions good bearings were produced. In regard to heating the shell and shaft, there is room for discussion. How about where the shells are in a yoke, having unequal masses of metal, and must be heated in a furnace in which the whole mass could be brought up to an even heat? Uneven heat causes uneven expansion which will throw the shells out of alignment. Take, for instance, the head yoke on a 30-in. matcher or planer. The bearings are 2¼ to 3 in. in diameter and from 8 to 12 in long, connected by a more or less irregular yoke. To heat the shells will throw them out of line, necessitating hours of scraping to get a good bearing.

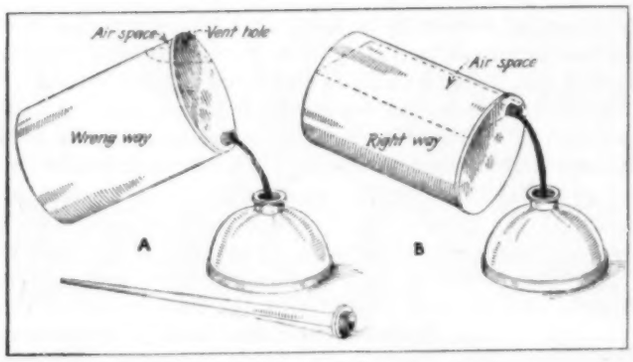
My experience has been that better results can be had by pouring the babbitt into the castings while they are at the natural temperature, pouring both cap and base at the same time and using notched liners so that they can readily be separated. After pouring, if not too much of a rush job, let everything alone until the bearing is cold. By so doing, permanent distortion due to the heat of the babbitt will be obviated. The shaft being noncompressible, holds the babbitt tight in the shell, thus to a great extent helping to produce a bearing with the lining as tight as is possible to get it without tinning or peening, which is not practical in the great majority of repair work.

To arbitrarily set the temperature at which all babbitt should be poured, within a limit of 40 deg. F., does not look reasonable to me. One manufacturer of babbitt puts out a line of goods which he recommended should be poured at temperatures ranging from 600 to 1,000 deg. F. No doubt Mr. Armstrong has determined by experiment the best method for his particular line of work, and the grade of metal to use, but it would be as absurd for me to say that, because the metal I use should be heated from 710 to 750 deg. F., that he is spoiling his metal by heating it from 860 to 900 deg. F., as it is for him to say that all grades of babbitt should be poured at this arbitrary temperature.

Two Ways to Fill an Oil-Can

By Harold E. Goodrich

In trying to fill a small oiler from a full can, the average mechanic wastes a varying amount of oil, due to the fact that the flow is intermittent and therefore hard to control or "steer" into the small opening in the oiler.



The wrong and the right way

The method of providing a vent hole at the upper side of the container is more than generally believed to furnish all possible relief for the annoying action of the fluid as it flows out of the lower hole in fitful starts and stops. This method is shown at *A* in the illustration.

A much more economical way is illustrated at *B*. It will be observed that no vent hole is here required, and that the air space is always right where it belongs to insure a steady flow from the container on the same level with the flowing liquid.

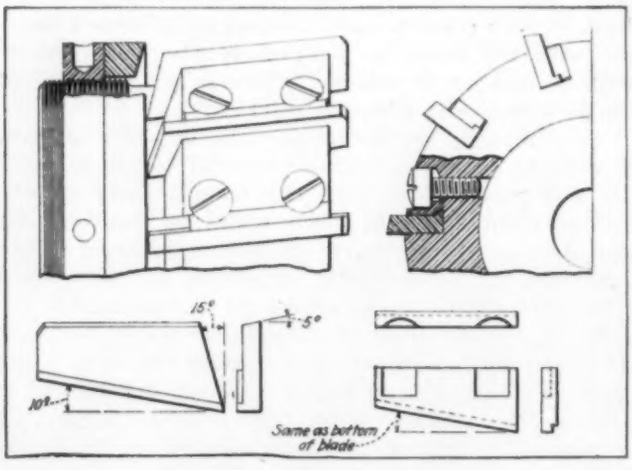
An Expansion Machine Reamer

BY HARRY C. MCMILLAN

I recently designed the expansion machine reamer shown in the drawing and found it simple to make, easy to adjust, and very strong and accurate.

While the drawing shows the construction of the reamer plainly, I wish to call particular attention to the simple manner of making the blades and of holding them in place.

It will be noted that the clamping pads hold the blades securely in the bottoms of the slots, and that



Construction of the reamer

where adjustment is necessary, the screws need only to be loosened slightly to allow the adjusting ring at the back of the blades, to be turned.

By tightening the clamping pads, the blades are securely held in position. The pads and blades are easily and cheaply made when replacements are necessary.

We have had excellent results from reamers constructed in the manner described.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Magnetizing Tools

Q. I noted a statement that a tool while red hot was put on a magnetizer and magnetized. Can you tell me how the steel was magnetized at red heat?

A. When steel is heated to the point of "recalescence" it loses all magnetism. Probably the theory in the shop doing the work was that the magnetic permeability of the steel would be favorably affected by passing a charge through the tool while red hot. We have never heard of such a theory, however, and are not able to see how the attempt to magnetize at red heat would affect the steel in any way after it has been hardened and cooled.

Black Coloring of Brass and Aluminum

Q. What kind of acid is used to blacken brass parts? Is there any acid that could be used to blacken aluminum?

A. None of the oxides or salts of brass and aluminum are black, and it is therefore not possible to use an acid method of blackening. Brass is blackened by means of black-nickel plating, and the same process can be used for blackening aluminum.

A simple "arsenic-black" solution is prepared by dissolving arsenic trioxide in sodium cyanide. But the solution most used for this type of plating consists of 8 oz. of nickel-ammonium sulphate, 1 oz. of zinc sulphate, and 2 oz. of sodium sulphocyanate to each gallon of water.

Nickel anodes are used with low current density, and only 1 volt between anode and cathode. The solution must be kept neutral by adding zinc carbonate as required, and agitating. The black color is derived largely from the sulphur and the zinc salts. As soon as the work is blackened it must be removed and washed, and when dry should be lacquered at once to prevent streaking.

Cutting a Large Keyway Without Machinery

Q. We have a job of cutting a 1½x½-in. keyway in a flywheel with a bore of 6 7/16 in. and a hub 28 in. long. This work is to be done in the back woods. Will you please inform us if you know of a better way to cut this keyway than by using a hammer and chisel?

A. We believe that the best way to do this job without machinery is to fasten the wheel securely to the shaft over the shaft keyway, and drive through the keyway a hardened steel drift that will plane out the keyway in the pulley. A set screw is sufficient to hold the wheel in place while doing the work.

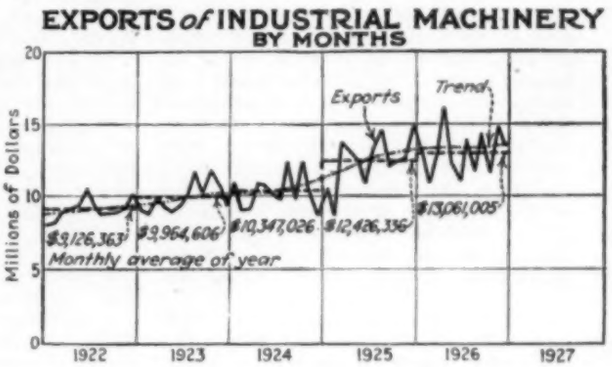
The drift should be fitted to slide in the shaft keyway, and should have a sharp ground cutting edge on the front upper edge. Take light cuts at first, and after each through cut is made you can raise the drift by putting thin shim strips on the bottom of the shaft keyway.

Activity in the Metal Working Industries

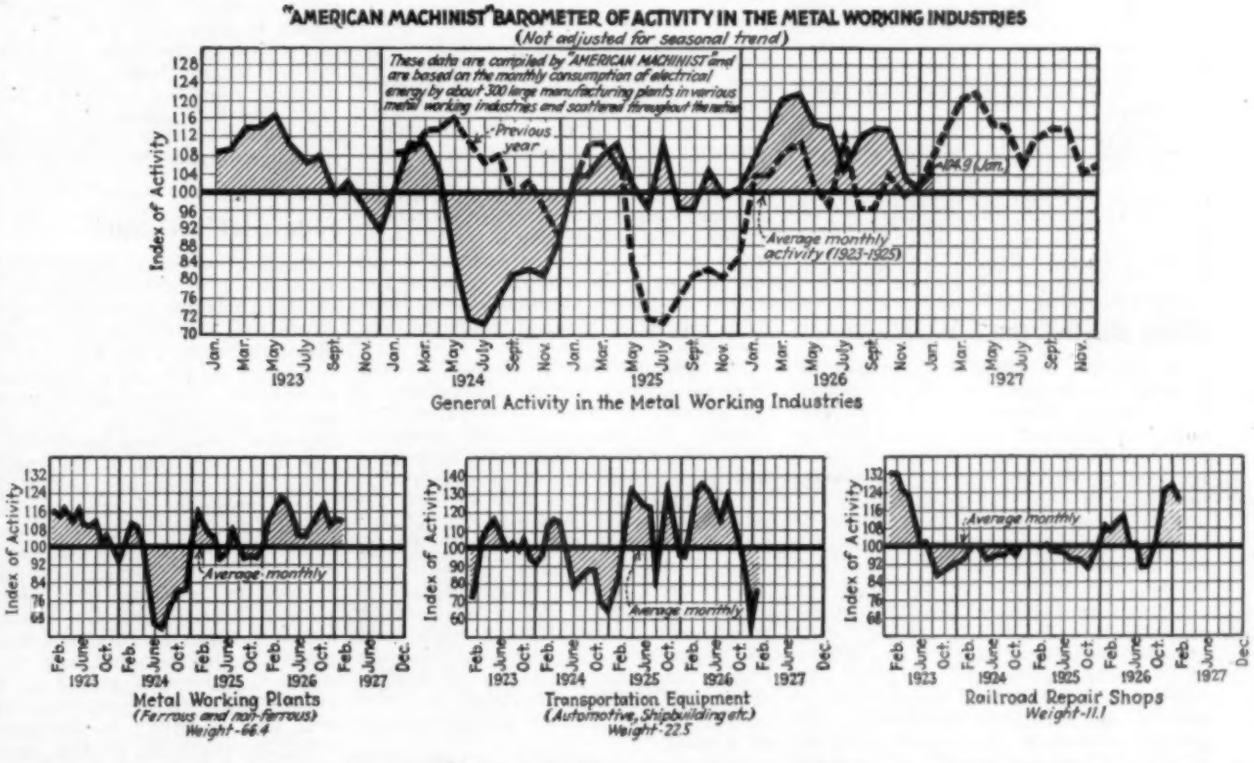
Productive Operations Increase

The metal working industries of the country opened the new year with the usual seasonal increase in productive operations. In November and December recessions in the operations of the metal working plants were apparent, but preliminary figures available for January indicate that this downward trend has ended and the January operations were 4.2 per cent higher than those of December. This is the normal increase in general productive activities to be expected at this season of the year, based upon the operations of past years.

A significant fact, however, is that the January operations of the metal working industries were 3.7 per cent below those of January of last year, which is only the second time since March, 1925, that operations have been below those of the same month of the year previous. American industry as a whole also reported operations below those of January of last year, the January operations of general industry being 5 per cent lower than the operations of January, 1926. This situation would seem to confirm the previous opinion that 1927 industrial operations would be slightly below those of last year. Operations in the railroad repair shops also showed a decline during January.



These conclusions, and the charts of industrial activity, are based on figures for electrical energy consumption as collected by the *Electrical World*. Industrial machinery exports, as reported by the Department of Commerce for the month of December, also indicate a slight total decline, although the figures for the entire year 1926 show average monthly exports of machinery well above the average for the previous year. Stability of business is apparent, and there is every reason to feel that the metal working industries will continue on a high level throughout the year.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Index of Activity
Previous year
124.9 (Jan.)
Average monthly activity (1923-1925)
General Activity in the Metal Working Industries
Metal Working Plants
(Ferrous and non-ferrous)
Weight-66.4
Transportation Equipment
(Automotive, Shipbuilding etc.)
Weight-22.5
Railroad Repair Shops
Weight-11.1
Average monthly

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Technical Abstracts

Balsa Wood Propellers for Large Airships

The weight of large propellers is a serious item in aircraft construction as some run up to 17 ft. 6 in. in diameter. By using a balsa wood core and covering this with hardwood veneer the propeller secures sufficient strength and still weighs from one-third to one-half as much as the usual propeller of this size. The saving in weight of a single propeller of the size mentioned will permit the carrying of two extra passengers and two or more of these propellers are used on even small airships.

Balsa wood itself weighs only one-eight as much as birch or oak. The hardwood veneer is applied in strips 2 in. wide, and $\frac{1}{64}$ in. thick. The first layer is placed lengthwise and the next at 45 deg. An ordinary electric iron is used to iron the veneer down to the proper shape.—*Aviation*, Feb. 7, 1927.

Welding Developments

At the plant of the Newport News Shipbuilding & Drydock Co. applications of the various welding processes are increasing in number. The 4½-ton rudder of the coast guard cutter "Northland" is completely arc-welded. The stern frame was made in two parts which were annealed and then joined together by thermit welding. This is said to be the first instance of the use of thermit welding on a stern frame production job although it has long been used for repair work. The seams and butts of the decks and superstructures will be largely arc-welded instead of riveted.

A condenser for a 4,500-ton ship and four uptakes have been completely arc-welded. Many of the tanks for oil, gasoline, fresh and salt water, together with their piping are being welded.—J. W. Owens, *Journal of the American Welding Society*, January, 1927.

About Buying Drop Forgings

In quoting on special forgings the Kilborn & Bishop Co., New Haven, Conn., makes the reservation, "Charges made for dies and tools do not convey ownership nor the right to remove them from our possession, but they do convey the right to their exclusive use."

This reservation is not made to create a monopoly for the company. It was adopted to avoid the evils that would exist without it. Some of the reasons why the reservation is necessary follow:

Orders placed always on the lowest price would necessitate shipping dies from shop to shop, and the dies would not fit all hammers. Reshaping the shanks would be undertaken only at the risk of the owner, or customer on whose work the tools are used.

The design of dies varies with different companies. Dies of a design suitable for rapid production in one shop might hinder production in another.

If all forging companies used dies that they did not own, no one of them would have an interest in their upkeep or replacement. Interest of ownership is important because of the effect of the operator's methods upon the life of dies.

The price paid for forging includes a charge known as die replacement, which is a reserve set up by the forging company. Subsequent sets of dies are paid for from that fund.

A purchaser of forgings in less than life-of-the-die quantities should select a reliable forging company and give it the order, either with or without a previous estimate. Every company must, on the average, charge cost plus a return on its investment. The purchaser who "buys dollars" generally gets dollars and the one who buys forgings for quality will get quality.

Rejections cost many times the value of the pieces involved, in inspection; delayed production; faulty production; charging back; and above all in irritation.—H. Kilborn, *Iron Age*, Feb. 10, 1927.

Storage-Battery Locomotive for Yard Work

A 120-ton, standard-gage, storage-battery locomotive built by the General Electric Co., and equipped with a 120-cell battery supplied by the Electric Storage Battery Co., is now in service in the Randolph yard of the Illinois Central Railway. The locomotive is driven by four 200-hp., 225-volt motors connected to the wheels through a gear reduction of 66/16. The battery is capable of supplying energy for the average eight-hour, yard-switching service on one discharge at an average speed of 7.33 m.p.h. If slowed down by coasting to the average speed of the steam switching locomotive, it will work for more than 12 hours on one discharge.

The principal virtue of the locomotive, aside from smoke abatement, is the greatly increased acceleration obtained. The locomotive also carries a "kicker" power source in the form of a 200-hp., gasoline engine driving a 135-kw. generator, which may be used for boosting the battery while the locomotive is at work and for driving on long runs between charging points. For yards where outside energy supply is available for third rail or overhead it is intended to substitute a high-speed motor-generator set for the gasoline engine since this power can be used to drive the battery-charging generator instead of the bulkier gasoline-engine equipment.

Tests were conducted by officials of the Chicago & Northwestern Railway Co., when it was operating in the Chicago passenger terminal. The locomotive was used for shifting and spotting mail and express cars in and about the terminal, and the results of a four-day test showed that, on the average, 56.3 kw.-hr. per hour is required for this kind of service. Based on a 620-kw.-hr. battery capacity, this locomotive will do the work for twelve hours on one discharge, without the use of the gasoline engine "kicker," at a total cost of $8 for power, or 67c. per hour. This is based on a unit cost of one cent per kilwatt-hour at the charging plug.—*Electrical World*, February 5.

Making Sleeve Valves for Minerva Engines

There are twenty-three operations on the sleeve valves, the finished thickness being 0.14 in. Sleeves are rough bored on a special 2-spindle lathe, leaving 0.037 in. for reaming, and for rough and finish grinding. The light walls of the sleeve make extreme care necessary to avoid distortion. The outside is then turned, bringing the wall thickness to 0.177 in., a second light cut leaving a grinding finish.

There are a number of drilling operations before the grinding. The ports are also milled on a Cincinnati machine and the ears drilled on a Barnes 20 in. drill, a Wilmarth & Morman machine removes the burrs on the oil grooves.

The outside is ground on a Cincinnati machine while a Heald grinds the bore, which is afterward honed on a special machine using 5 blocks of carborundum in the honing head. Grade 80-L is used for roughing and 120-L for finishing. The hone speed is 320 r.p.m. and has 80 strokes per minute—*The Automobile Engineer*, November, 1926.

Industrial Accidents

Studies made by The Travelers Insurance Co. of detailed reports of accidents in various types of industry, indicate that the incidental cost averages about four times the direct loss, which is usually covered by compensation and insurance. Unfortunately, little information is available to reveal the exact financial loss. Such incidental factors should include cost of the lost time of the injured employees; cost of time lost by other employees who stopped work either out of curiosity or sympathy, or to assist the injured employee; the cost of time lost by foremen and other executives in assisting the injured employee, investigating the cause of the accident, breaking in a new man to replace the injured one, and preparing accident reports or attending hearings before industrial commissioners. The cost due to injury to the machine or other property or to the spoilage of material is often neglected as is the incidental expense due to the interfer-

ence with production, failure to fill orders on time, loss of bonuses, payment of forfeits, and similar causes. Often the employer must continue the wages of the injured employee, although he may be worth only 50 per cent of his normal value while recuperating. Examples found in an iron foundry, in machine shops, in woodworking shops and clothing factories indicate that these miscellaneous items can easily be four times or more the actual compensated loss.—H. W. Heinrich, in *Manufacturing Industries*, January, 1927.

Centerless Grinding in Auto Plants

In one large automobile plant the following operations are performed on piston pins:

Two passes through a Heim centerless grinder remove 0.007 in. per pass, with a production of 250 pins per hour through both operations.

A Cincinnati centerless grinder performs the semifinish operation, consisting of one pass removing 0.002 in. of stock and one sizing pass removing 0.001 in. of stock, with a total production through both operations of 500 pins per hour.

Finishing operations are performed on a Cincinnati centerless grinder, the first pass removing 0.001 in. and the finish pass removing 0.0002 in. of stock, with a total production through both operations, of 500 pins per hour.

The pins are taken to a lapping machine for the final operation. This consists of mounting 50 pins on a plate arranged with spokes extending out from the periphery and lapping with a grinding compound between two heavy cast-iron plates.

The finished pins are checked on a fluid gage and V-block for size, taper, and eccentricity. They are held to 0.0002 in. for taper and 0.0001 in. for out-of-round. The diameter is held to limits of 0.9986 to 0.9988 in. The pins are separated for assembly into divisions varying by 0.0001 in.—H. F. McClung *Abrasive Industry*, February, 1927.

Aero Engine Valve Steels

Exhaustive tests in England indicate that a high nickel-chromium steel has decided advantages for engine valves subject to high temperature. Tests were made at temperatures running up to 1,742 deg. F. and while all steels showed a somewhat rapid decline in tensile strength, the high nickel-chromium steels decreased more gradually than the others. All the materials tested had distinct air-hardening properties.

The steels tested contain from 12 to 19 per cent of nickel, from 12 to 13 per cent of chromium and from 1.47 to 1.75 per cent of silicon. These steels in the opinion of Mr. Henshaw, who made the tests, have several advantages for use in high duty internal combustion engines of any kind. The forging presents no real difficulty, depending on controlling the forging temperature within closer limits than usual. Forging temperatures ranging between 1,920 and 2,010 deg. F. were found to give the most satisfactory results. The same metal is believed to be well worth consideration by makers of high-grade automobile engines.—*Engineering*, Dec. 3, 1926.

The Influence of Welding on Machine Construction

The development of improved welding methods during the last ten years has placed at the disposal of steel and iron workers a process of joining metals which is rapidly revolutionizing industrial production methods. Welding is truly a steel founding process applied locally on a small scale. It makes possible the joining of metals satisfactorily, with minimum time and labor for preparing and completing the job.

By substituting rolled material for cast material, industry is following somewhat along the lines of past experience. There is less waste involved in the fabrication with rolled material than with castings, and the number of machining operations is less. It is possible to fabricate within very close limits—almost exactly to size—while a certain allowance must be provided for in castings due to shrinkage, roughness, and physical variations in the molding operation.

The elimination of the pattern shop and pattern storage is another feature that follows the fabrication of rolled material. This item reduces overhead—the great problem of the factory cost department—W. L. Warner, *Machinery*, February, 1927.

Abrasive Garnet in Canada

The progress of modern industry is to a large extent dependent on abrasive materials and a better knowledge of their correct application.

Abrasive materials produced in Canada are natural ones, such as grindstones, sharpening stones, pulpstones, certain forms of silica (quartz), volcanic dust, and diatomite. There was an output of garnet in 1924 and it is expected to be produced again in 1927.

Garnet coated stock in the form of belts, disks, and rolls, is now almost universally employed on the American continent in all of the hardwood-working industries.

There are a number of garnet deposits in Canada, several of which should be well suited for the production of abrasive material. One company shipped during 1923-24 over 1,000 tons of rough concentrates from a deposit in the northwest corner of Ashby township, Ontario.

An excellent deposit of garnet occurs two miles southwest of Labelle, Quebec, 100 miles north of Montreal. The mineral occurs as large, deep wine-colored masses associated with solid pyrrhotite.

The demand for garnet for the surfacing of plate glass is increasing, and there are now several firms using very fine grades in the "fining" operations between the coarser sand and the final polishing with rouge. Excellent results are claimed by a large manufacturer who crushes the ore (which carries about 35 per cent garnet) to about 300 mesh and water-grades the pulp without concentration, into four grades for direct use on the surfacing machines.

American or Canadian garnet concentrates are valued at about $85 per ton, and Spanish or inferior grades $50 to $60.—V. L. Eardley-Walmot, *Abrasive Industry*, February, 1927.

Services of a Company Library

The functions of a company library are twofold: to give information when required; to educate the personnel of the company. At the Dennison Manufacturing Co. the library keeps up a classified list of subjects in which various officials and others are interested. Material taken from books, magazines, etc., is sent to the interested individual. When special requests are received the library uses its own resources and its outside contacts with special libraries and universities to meet them. Circulars and pamphlets are routed to interested divisions of the plant.

In collaboration with the education division reading courses are planned for those who wish them. A monthly review is published for the benefit of the personnel, as well as bulletins and a library page in the house organ. Book circulation is being restricted to non-fiction because of the expense involved in getting enough copies of best sellers. Magazines are requisitioned by and through the library. Fifteen general magazines are circulated and all others are sent to the departments interested. Small branch libraries are being established in two of the factory divisions. Fiction will be handled by a branch of a regular lending library organization.—F. A. Mooney, *The Management Review*, February, 1927.

Inspection and Maintenance Routine That Keeps Storage-Battery Trucks and Tractors in Service

A fleet of trucks and tractors, utilized in handling baggage and mail at the Chicago Union Station, is in practically continuous operation. Batteries are changed for charging at the end of each two shifts, 16-hr., or as required. However, in about one-third of the trucks and tractors, batteries are changed at the end of each shift. Except when changing batteries, the truck stops only long enough to change drivers at the end of the other shifts. The batteries are lifted off the trucks or tractors with a hand chain-hoist or a monorail. The hoist is provided with a yoke and chain, especially constructed to hook onto the batery box and place it on a hand lift-truck platform.

Each day one truck or tractor is taken out of service and all wearing parts given a complete inspection before they are again lubricated. It takes about a month to go over all the fleet. Once a year, however, each truck is taken apart, the grease chambers and feed lines cleaned out, all parts carefully checked for wear, and renewed or tightened up where necessary. After this overhauling, the truck is re-assembled, oiled and greased, and is operating again practically as good as a new truck.—W. Landess, *Industrial Engineer*, February, 1927.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Has Apprenticeship Passed?

IN ONE of the papers presented at the S.A.E. annual meeting in Detroit the sweeping statement was made that "Specialization is the key to modern industry. The apprenticeship system has been practically wiped out, and to a very large extent opportunity for a well-rounded experience and training in the regular processes of industry no longer exists."

This statement hardly does justice to the efforts being made by many important manufacturers to train mechanics. It is a well known fact that there are numerous large and small firms that have well planned apprenticeship courses both for the grade school boy who desires to become a mechanic and for the technical graduate who aims to be an engineer.

But in the statement there is an underlying truth. The old-fashioned apprenticeship, that bound a boy to one or two years of sweeping and chores before he got a chance to work on a machine, has been wiped out, and in its place there has been substituted the systematized course, frequently under trained instructors.

The United States Bureau of Labor Statistics is at present engaged on a study of apprenticeship in the United States. Enough information has already been gathered to indicate that as many apprentices are being trained today in proportion to the requirements as the old apprenticeship systems ever trained, and that the apprenticeship schools of industry now turn out workmen in less time and furnish them with a more intelligent idea of the significance of the trade.

Helping the Engineering Teacher to Keep Out of Ruts

ONE of the drawbacks of the teaching profession is the difficulty in avoiding ruts. The engineering teacher's work is largely of a routine nature and very often he has little opportunity for outside contacts. As a rule his salary is insufficient to permit much visiting in spare time unless he happens to be near a number of large plants. The result is likely to be mediocre instruction for the men under his tutelage and a serious lack of inspiration.

Industry can do much to remedy this evil. And anything it does will be to its own advantage because it will secure better recruits for its rank and file of prospective executives and technicians. It could turn over to qualified teachers occasional researches or investigations out of the line of the regular work of its own engineers and pay a reasonable amount for the job. It could provide employment in various departments during the long vacation periods that are among the advantages of the teacher's job. It could form part-time connections with these men to permit them to broaden their point of view and at the same time add to their income. Industry would not lose by any of these arrangements. It would get the worth of its money for the immediate work done and as a by-product the better equipped students that would be trained by the more efficient instructors. Some notable examples of the success of this policy are on record but much more can be done than has been done and it will pay rich dividends.

Consolidating Inspection of Naval Material

INSPECTION of material is of great importance to both the vender and the purchaser. Anything which simplifies the process saves money for both and expedites business. It is therefore very gratifying to learn that there is a trend toward a consolidated inspection service for naval material.

Naval material is now inspected under the direction of each of its seven bureaus. Each has its own inspection field force with some interchange at times. In some of the large cities there are now four or five separate Navy inspection offices, separately administered, with corresponding confusion and delay in many cases. Those who are working for a consolidated service cite increased economy, greater efficiency, less confusion, greater flexibility and better controls as some of the results that are sure to follow.

The idea is not new and it involves several problems. A general inspector would be necessary to prepare general administrative instructions, assign personnel and have general control. Advantages similar to those secured by a consolidated purchasing system should be readily secured, and the plan has much to recommend it. It is gratifying to note that the change is being advocated by officers with wide experience in inspection work. These forward looking officers are to be commended and it is to be hoped that the change can be effected without serious opposition and within a reasonable time.

Have You a Replacement Policy?

Shop Equipment News

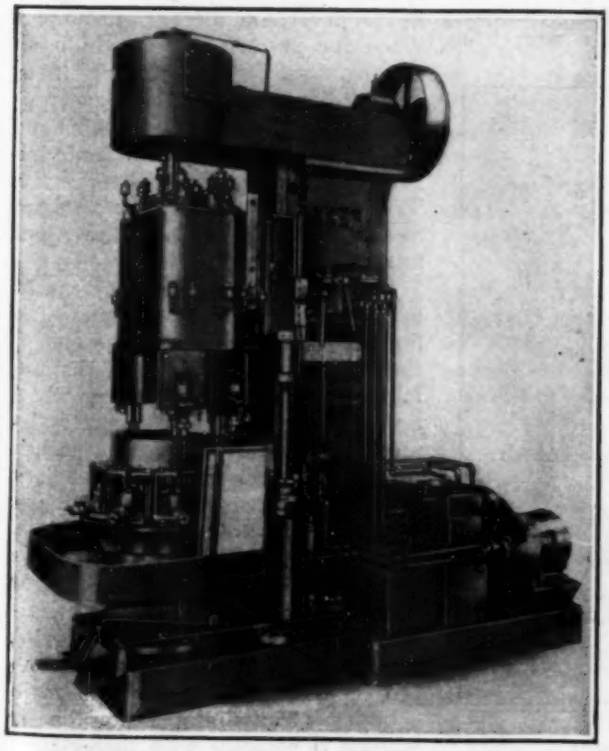
Baker No. 50 H Hydraulic Boring and Drilling Machine

THE No. 50 H vertical boring and drilling machine with twin hydraulic feed has been placed on the market by Baker Brothers, Inc., Toledo, Ohio. It is a production machine and can be furnished in a variety of sizes and capacities depending upon the work to be done.

Because of the simplicity of the design, the machine can be modified as to clearances, number of spindles in the head, center distance between spindles, etc., to take care of a wide variety of work. It is particularly adapted for use in connection with an indexing table or fixture, either for successive operations on the same piece or for long drilling operations where it is desirable to perform drilling in several steps on account of the excessive wear of the drill that takes place in long holes and the inability to properly cool the drill or withdraw the chips. In an operation of this kind with this machine, the work can be indexed to the first station and fed a portion of the way through and then indexed to the next and fed a portion further and so on until the last operation finishes the entire length of feed. In this way a much coarser feed can be used, and, besides obtaining an increased production, the wear on the drill is greatly reduced.

The head carrying the drills is supported on a saddle that moves upon carefully scraped ways. Two cylinders are used for the feed mechanism, one on each side of the head of the machine. They work in unison and give a powerful and extremely smooth drive. The feed is by means of pull rather than by push. The feed is started by a foot pedal and thereafter is entirely automatic. The head has rapid advance to the work, slow feed during the drilling operation, and rapid return to the starting position, where it stops.

The rate of feed and the position at which the rapid traverse starts and stops can be quickly changed by means of a simple adjustment. On the multiple-spindle type machines, the spindles all have independent vertical adjustment to take care of the different drill or tool lengths so that all tools enter the work at the same time. An Oilgear pump is used to furnish the hydraulic pressure.



Baker Hydraulic and Drilling Machine

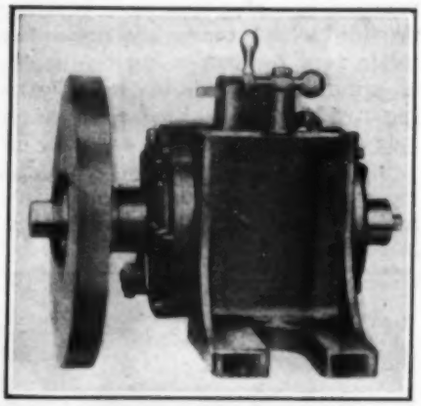
The multiple head contains hardened alloy-steel gears mounted on shafts rotating on ball bearings. Provision is made to properly lubricate all moving parts.

The machine can be furnished with either belt or motor drive. In the latter case, two motors are required, one for driving the machine itself, and the other for driving the hydraulic feed pump. The pump requires 3 hp. and the main drive requires a motor ranging from 10 to 40 hp. depending upon the size of the work to be performed.

The weight of the machine without fixtures, tables, or tools, but with a 5-spindle head is approximately 4 tons.

Standard Electrical Tool Co. Angle-Plate Parallel Grinder

The Standard Electrical Tool Co., 1938 West 8th St., Cincinnati, Ohio, has brought out the angle-plate parallel grinder shown in the accompanying illustration. This grinder is especially adapted for roll grinding and general grinding on a lathe,



Standard Electrical Tool Co. Angle-Plate Parallel Grinder

or for surface grinding on a planer or boring mill. The angle plate is bolted on the compound rest of the lathe or to the ram of a planer or boring mill.

The grinding wheel is mounted directly upon the armature shaft, which is made of 3½ per cent nickel steel, ground to size. The bearings are made of high-grade phosphor bronze and are in the form of split tapers so as to be adjustable for wear. The bearings are also dustproof.

The grinder is manufactured in five sizes, with ¼-, ½-, 1-, 2- and 3-hp. motors, respectively. The motor can be furnished for either a.c. or d.c.

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Micro Portable Locomotive Crankpin Grinder

THE portable grinder shown in Fig. 1 is for trueing out-of-round locomotive crankpins. It has been added to the line of railroad shop tools manufactured by the Micro Machine Co., Bettendorf, Iowa. With the standard spindle furnished, this machine will grind locomotive crankpins ranging in diameter up to 10 in. and having bearing lengths up to and including 9¾ in. It will grind all single diameters of side-rod pins and both diameters of main pins up to a total length of 20 in. in one setting. The machine can be applied to driving wheels, either under or out of the locomotive.

The grinding is accomplished by means of a series of grinding wheels mounted on a ball-bearing spindle which revolves around the pin. The spindle is eccentrically mounted in a ring-type main bearing provided with a coarse and fine automatic feed for increasing the depth of grinding cut while the main bearing revolves. The headstock has a longitudinal oscillating movement of ¾ in. on its slideways, actuated by means of a cam located under the motor so that uniform wear of the grinding wheels is assured and any tendency toward a taper condition is eliminated. The driving cam of this oscillating movement is so timed with the main bearing that the path of the grinding wheels changes continually. A line on the outer diameter of the cam provides the operator with a means for adjusting the stroke or travel of the slide without the possibility of overtravel. The drive for the cam is completely housed under the motor mounting pad and runs in a bath of oil.

The power drive of the cam can be disengaged when it is desired to obtain a long travel of the slide in dressing the grinding wheels with a diamond. The diamond is clamped rigidly in an adjustable holder mounted on the base of the machine.

The truck frame is made of cast steel of channel-type construction. Pads for squaring the machine to the locomotive driving wheel and for supporting the bed are cast integral. Three jacks of rack type are provided for elevating and leveling the machine in set-up. They are operated simultaneously by means of a hand crank through gearing and independently by means of a wrench on the threaded foot pads. The bed is a ribbed cast-iron unit. Each slideway is 2⅞ in. wide by 39 in. long and the width over both ways is 29⅜ in. The cross-slide, which is used for quick centering in the set-up, is provided with lock nuts at four corners, and when tightened becomes an integral part of the frame.

The headstock and carriage are cast integral. The slides are protected from dust and grinding compound and are equipped with take-up gibs and adjusting screws to compensate for wear. Power engagement of the headstock is by means of a clutch operated by a conveniently located lever, and a crank is also provided for revolving the main bearing by hand. This bearing is of ample diameter to allow generous clearance around the larger pins and is counterbalanced to eliminate vibration. It is lubricated by gravity. The machine is driven by a 7½-hp motor rotating at 1,750 rev. per minute.

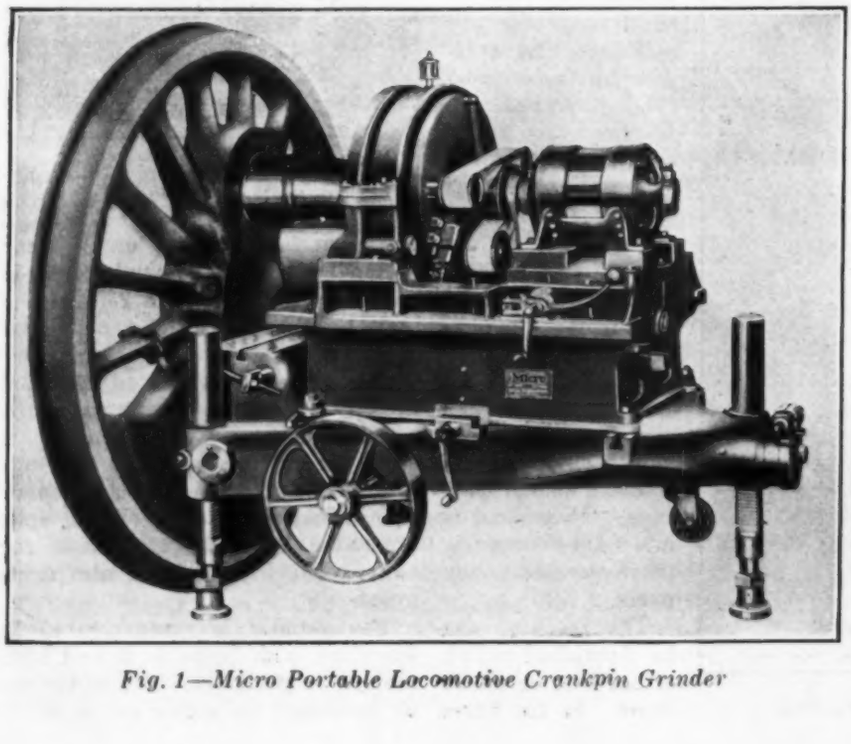


Fig. 1—Micro Portable Locomotive Crankpin Grinder

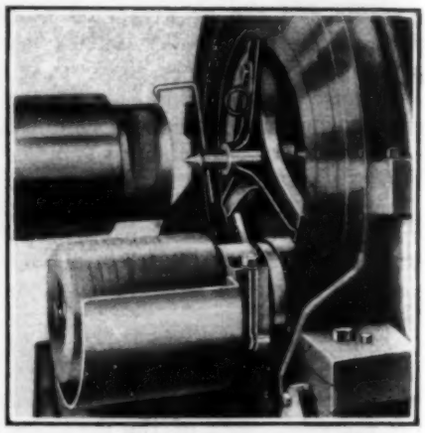


Fig. 2—Removable centering spider

It is said that the machine can be set up in from 15 to 20 min. The finished squaring pad on the end of the base is butted against the finished hub face of the driving wheel and anchored tightly thereto by means of a threaded chain lashed around two spokes. The outer jack is then raised or lowered until the machine is square with the hub face. The centering of the grinding circle to the pin is completed by raising or lowering the entire machine universally and by adjustment of the cross-slide. Fig. 2 shows the removable centering spider in the main cylinder. The sliding center bar is pointed to coincide with the original

Shop Equipment News

lathe center of the pin. A final check can be made by revolving the needle around the outer end of the main pins, as illustrated.

The machine occupies a floor space of 5x6 feet.

Watervliet Adjustable Reamers

The Watervliet Tool Co., Inc., Albany, N. Y., has brought out three lines of adjustable reamers for use with piston pin bearings of automobiles and trucks. The diagonal adjustable reamer without pilots is shown in Fig. 1. The blades, instead of being parallel with the body, are set at an angle giving them as far as possible an approach to the same shearing effect as on a spirally-fluted expansion tool. The threads for the adjusting nuts are fine, so that a close adjustment of size is possible. Each reamer expands a full $\frac{1}{16}$ in. so that the sizes all overlap. The blades are made of special tungsten steel.

The diagonal adjustable reamers are made in eleven sizes with a range

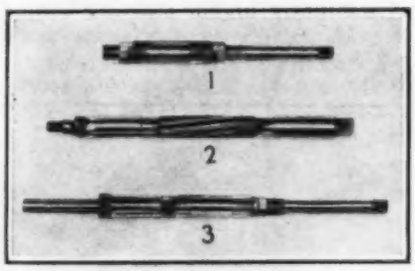


Fig. 1—Watervliet Diagonal Adjustable Aligning Reamer. Fig. 2—Spiral Expansion Aligning Reamer. Fig. 3—Diagonal Adjustable Aligning Reamer With Pilots

of expansion from $\frac{13}{32}$ to $\frac{31}{32}$ in. for the small size and from $1\frac{13}{32}$ to $1\frac{31}{32}$ in. for the largest size. The blades vary in length from 2 to 4 in., and the overall length of the tool varies from $5\frac{3}{4}$ to 12 inches.

The diagonal adjustable aligning reamer shown in Fig. 3 has front and rear guiding pilots. These pilots are of the spring collet type. They are made in fourteen sizes with a range of expansion from $\frac{13}{32}$ to $\frac{31}{32}$ in. for the smallest size and from $1\frac{13}{32}$ to $1\frac{31}{32}$ in. for the largest size.

The spiral expansion reamer shown in Fig. 2 is especially designed for piston pin bushings for all makes of cars and trucks. It is made of special tungsten steel, specially heat-treated to insure a uniform quick cutting edge. The tool both bores and reams. The self-cutting pilot does the rough cutting, leaving the reamer proper to do the finish reaming only. The front pilot guides at the beginning and the rear pilot at the ending of the operation.

Left-hand spiral flutes insure against chatter or digging in. The reamer cuts smoothly with a shearing motion and is said to leave a full bearing surface with a mirror-like finish. Adjustment of the reamer for size is obtained by means of a screw at the lower end.

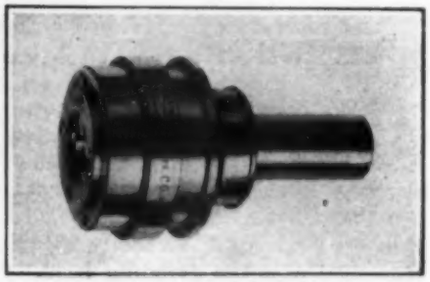
Reamers ranging from $\frac{3}{4}$ to $\frac{7}{8}$ in. in size expand from standard to 0.012 in. oversize. Reamers larger than $\frac{7}{8}$ in. expand from standard to 0.017 in. oversize. Each reamer is equipped with a positive lock nut to prevent over-expansion. This lock nut is riveted into place for the maximum expansion of the tool.

Murchey Type CO Self-Opening Diehead

The type CO diehead shown in the accompanying illustration is being made by the Murchey Machine and Tool Co., Detroit, Mich., for use on any machine where the diehead is revolved. The outstanding feature of this device is the collar trip which makes it especially adapted to shoulder threading and insures a precise length of thread, due to the fact that the diehead opens instantly at any predetermined point.

As in other dieheads made by this company, all parts are hardened and ground. The adjusting nut is accessible, being always in full view of the operator. The action is said to be positive and uniformly the same, with no tendency of binding. The chasers may be removed without taking off the cap of the diehead and without removing it from the spindle. This action can be accomplished by removing the spring stop collar and sliding back the shell, thus freeing the chasers which may now be readily removed. To replace them, it is only necessary to place each in its proper slot and to bring the shell forward and to remove the spring stop collar.

These dieheads are made in $\frac{7}{8}$-,



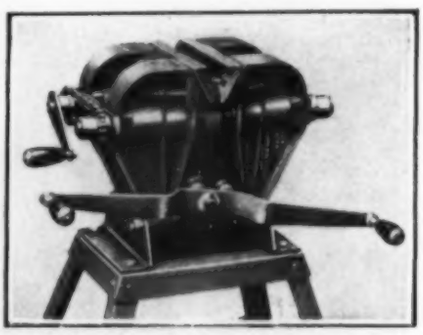
Murchey Type CO Self-Opening Diehead

$\frac{7}{8}$-, 1-, $1\frac{1}{4}$- and $1\frac{1}{2}$-in. sizes. The chasers are interchangeable with the type 0 series of dieheads. Opening and closing attachments for most types of machines are carried in stock, or where not in stock can be easily made.

Clipper No. 8 "Speed" Belt Lacer

The Clipper Belt Lacer Co., Grand Rapids, Mich., announces the No. 8 "Speed" belt lacer shown in the accompanying illustration. It is said that with this machine it is possible to lace both ends of an 8-in. belt in a single operation in $1\frac{1}{2}$ minutes. By means of a three-quarter turn of the crank the powerful jaws of this machine force a row of Clipper hooks cleanly and uniformly into the belt.

By employing a new principle of design, it is possible to apply a pres-



Clipper No. 8 "Speed" Belt Lacer

sure of about 45,000 lb. on the belt so that the hooks are imbedded in perfect alignment flush with the surface so that the life of the joints is prolonged and the wear on the pulleys is reduced to a minimum.

This No. 8 lacer will handle all belts from 1 in. up to and including 8 in. in width in a single operation, and wider belts in two or more operations depending upon the width.

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Radial-Type Way Grinding Machine

THE way grinding machine shown in the accompanying illustration is of German design. It is being marketed in this country by L. Sichel, 200 Fifth Ave., New York, N. Y. In this type of machine the work is traversed past the grinding head.

The machine consists of a base with traversing table for supporting the parts to be ground and a heavy, double-arm radial standard of quadrangular form. One arm of the radial has two small universal wheelheads, shown in Fig. 1, for which saucer or cup wheels are used. These heads serve to finish all surfaces and ways such as narrow flats, Vs, dovetails, sides, and undersurfaces of ways. On the other arm of the radial is a heavy-duty segmental-wheel surface grinder, intended for wide flats. The small heads can be swiveled in a complete circle and can be adjusted lengthwise along the rail in any position.

All grinding heads, including the large segmental wheelhead, have built-in motors integral with the grinding-wheel spindle. Ball bearings are incorporated in the design of all heads and are so arranged that no radial play can develop and adjustment is provided for taking up any axial play. The large head has automatic lubrication to both upper and lower bearings. All settings are obtained by microscrews with scales or spirit levels so as to insure the necessary accuracy and the proper assembly of parts without hand fitting.

The entire radial head rotates upon ball bearings and can be elevated by means of a handwheel at either side of the table.

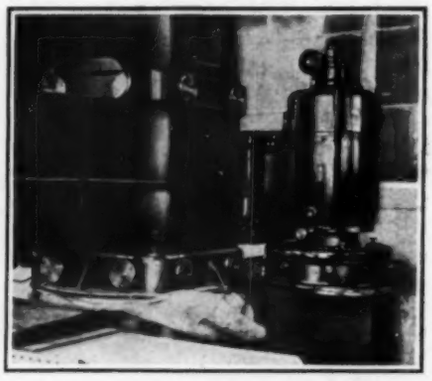

Fig. 2—Segmental-wheel surface grinding head

The bed is placed on a foundation plate of special design. The table is guided upon the bed in such a manner that a full-load bearing can be obtained even at the extreme position. Two table speeds are available, one for roughing, the other for finishing. These feeds may be engaged during operation by levers operated from either side of the machine. Reversal of the table is obtained by adjustable dogs in connection with the usual "load-and-fire" mechanism. A hand lever is also provided to throw the clutch out of engagement at any point of the stroke. For grinding the ways of beds, the column is made to move along a bed of suitable length to accommodate the work in hand. Reversal is secured by magnetic clutches. Power elevation to the rail is also provided.

All parts are fully protected against grit and dust. Ball and roller bearings are used throughout. Automatic lubrication is also furnished for important sliding parts.

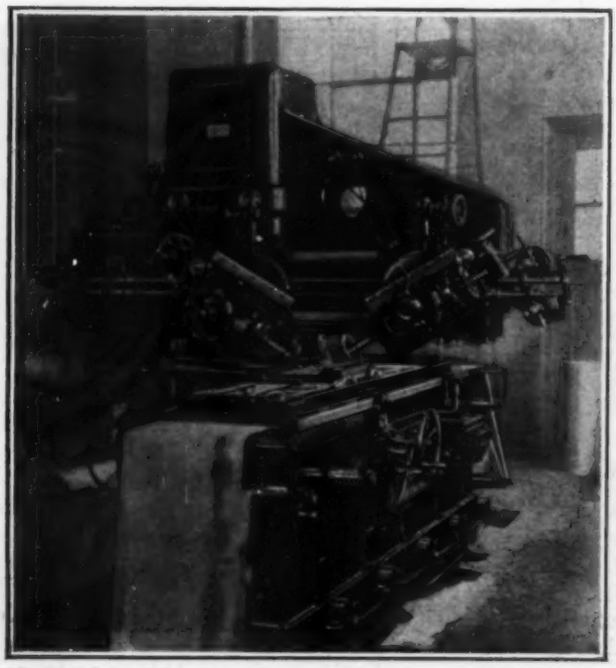

Fig. 1—Radial-Type Way Grinding Machine

General Electric High-Reactance General-Purpose Motors

An improved type of induction motor is announced by the General Electric Co., Schenectady, N. Y. A complete line of these motors bearing the designation FT, ranging from 7½ to 50 hp. is now available.

This line of motors is said to embody simplicity, reliability, low cost, and line-switch control involving full-voltage starting. The FT motors, in general, are suitable for application wherever the ordinary squirrel-cage induction motor with a compensator has been used. They give slightly higher starting torque, but approximately the same starting current as the squirrel-cage motor started with a compensator connected to the 80 per cent tap.

Rotor of a General Electric High-Reactance Motor

In appearance the motors are the same as the ordinary squirrel-cage type. The rotors, one of which is illustrated, are of cast aluminum construction with bars so shaped and located in the punchings as to give a high reactance effect at starting. The starting current is within the N.E.L.A. limitations up to and including the 30-hp. size.

An ordinary line switch of proper capacity can be used to start the motors but in order to obtain proper overload and undervoltage protec-

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tion, the motors are recommended for use with magnetic starting switches using push-button control. Where necessary, on the larger sizes, a compensator or resistor starter may be used as in the case of the ordinary squirrel-cage induction motor.

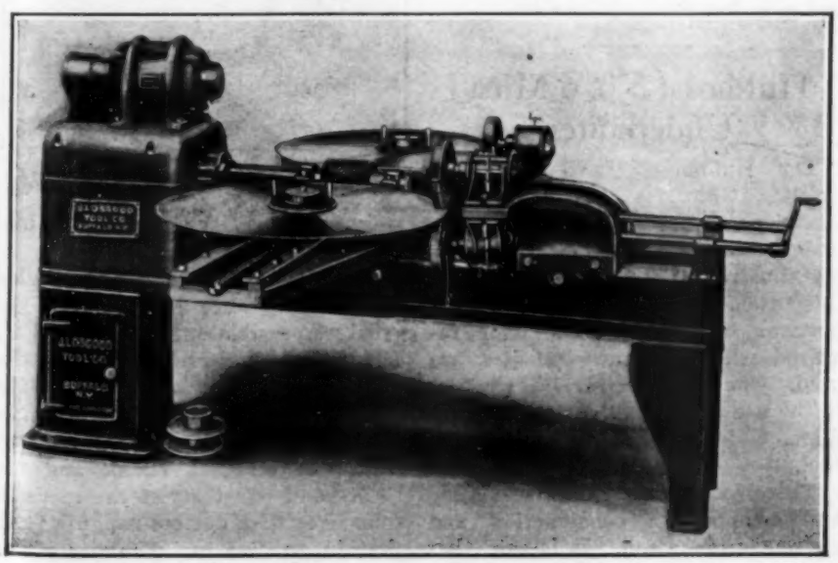
Osgood Cold Saw Tooth Cutting Machine

The duplex combination cold saw tooth cutting machine shown in the accompanying illustration was recently placed on the market by the J. L. Osgood Tool Co., 43 Pearl St., Buffalo, N. Y. It has a capacity for cutting saws ranging in diameter from 20 to 90 in. and from ¼ to ⅝ in. in thickness. Two saws of unequal diameter and thickness can be cut and ground at the same time as readily as two saws of even diameter and thickness, as each front and rear saw spindle and grinder head acts independently of the other.

The machine is fitted with a high-speed steel cutter 6 in. in diam. by 6 in. face, of 8 pitch with a spiral quadruple cut. The cutter runs in oil. The saw carriage is adjustable horizontally so that the full width of the face of the cutter can be used before the cutter is worn out. The machine cuts the teeth in the saw at the rate of 25 in. per min. on the saw periphery. Only two or three passes are required to finish the teeth.

While the teeth are being cut, two motor-driven emery wheels, one above and the other below the saw, are grinding off the steel burrs raised by pressure during the steel sawing process, or raised by the cutter itself in forming the teeth. The tooth cutting and burr grinding are done simultaneously, so that a smooth cutting surface results. It is claimed that with this method of cutting and sharpening, the saw will cut true and even surfaces having the appearance of milled surfaces.

The machine is regularly equipped with a 3-hp. constant-speed motor running at 1,200 r.p.m. The spindle is driven at 50 r.p.m. through reduction gears. Single-pulley belt drive can also be furnished with or without a countershaft. When two 7-ft. saws are being cut the floor space occupied is 11x16 ft. The weight of the machine is 4,500 pounds.

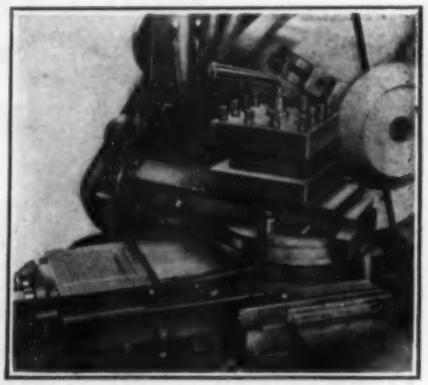


Osgood Cold Saw Tooth Cutting Machine

Gisholt Compound Slide for Turret Lathes

The Gisholt Machine Co., Madison, Wis., has developed a compound slide with power angular feed for its Nos. 3L, 4 L, and 5L geared-head turret lathes. These slides are particularly useful for the manufacture of bevel gears or other steep taper work.

This compound slide, shown in the accompanying illustration, is arranged to give power feed to the tool in any horizontal direction. The upper slide has 6 in. of travel on the No. 3L, and 9 in. of travel on the Nos. 4L and 5L turret lathes. The square-turret tool post can be used to turn or face diameters up to the full swing of the machine.



Gisholt Compound Slide For Turret Lathes

The compound feed and cross feed have both power and hand operation and are entirely independent of each other. The power feed to the cross feed slide is automatically disengaged when the power feed to the upper slide is engaged. The number and range of speeds are the same as the longitudinal feeds of the side carriage. Graduated index dials are placed on the screws for regulating the depth of feed.

This compound slide tool post is not a single-purpose unit, for it can be used to do the same work as is done with the standard tool post furnished on these lathes.

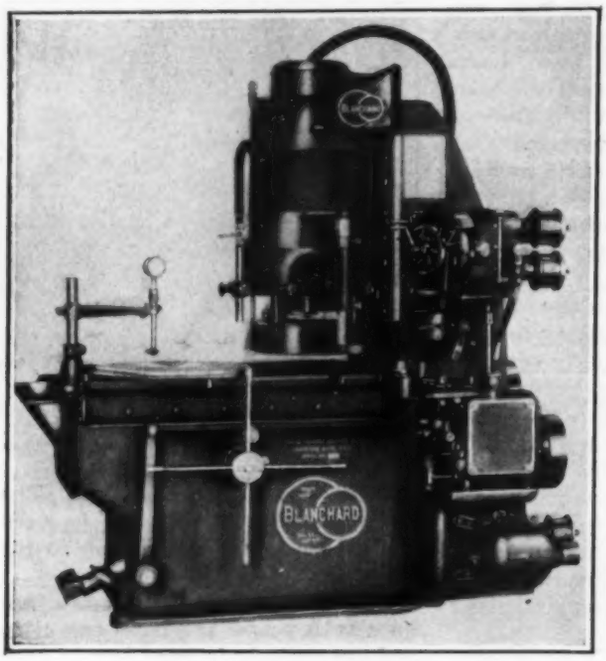
Blanchard Improved No. 16 Vertical Surface Grinder

The Blanchard Machine Co., 64 State St., Cambridge, Mass., has redesigned the base of its No. 16 vertical surface grinder so that it has larger water capacity and a longer bearing on the floor, although the overall length is increased only 2 in. The illustration shows the grinder with a 26-in. magnetic chuck and caliper attachment.

The improved base holds over 100 gal. of coolant as compared to 65 gal. in the old base. This additional capacity helps to keep the work and machine cooler on heavy grinding.

The treadle shaft is neatly housed in the end of the base. The other end of the base under the column is carried straight down to the floor in-

Shop Equipment News



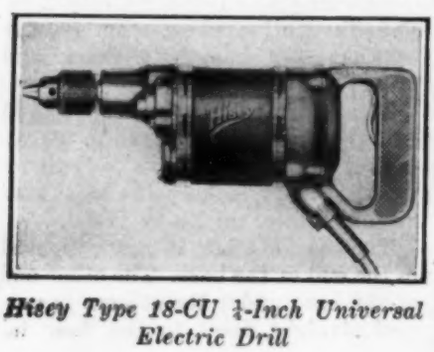
Blanchard Improved No. 16 Vertical Surface Grinder

stead of being undercut. These changes of outline improve the appearance and distribute the weight over a larger floor area without appreciably increasing the space occupied. The motor connections, formerly placed in a box on the back of the base, are now found inside the column.

Hisey Type 18-CU ¼-Inch Universal Electric Drill

The standard type 18-CU ¼-in. universal electric drill shown in the accompanying illustration is being marketed by the Hisey-Wolf Machine Co., Cincinnati, Ohio.

Like other Hisey drills, this tool is equipped with a motor of this company's design and manufacture, particularly adapted for this type of service. The motor is mounted on



Hisey Type 18-CU ¼-Inch Universal Electric Drill

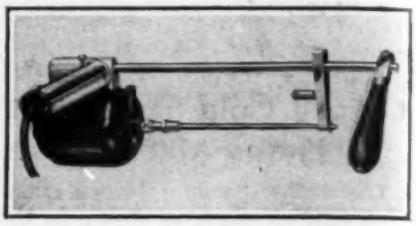
ball bearings, which in turn are fitted in such a way as to eliminate slip and creeping action. The gear mounted on the armature shaft is removable. All gears are proportioned to give maximum strength and smooth operation. They are made of high-grade steel, electrically heat-treated. The compound gear shaft is supported with bearings at each end. The oversize chuck spindle is hardened and ground and is automatically lubricated through the gear case. A standard Jacobs' chuck is fitted to this spindle. Brush holders with adjustable spring tension are mounted as a separate unit on a Bakelite yoke, so that it is possible to adjust the brushes when necessary. The end handle cover is a rugged casting carrying all pressure applied to the drill, and it is independent of the motor and motor bearings, thus relieving them of all strain. This construction is also said to afford convenient access to the carbon brushes for adjustment or renewal. An automatic quick-release type switch is mounted in the end grip handle.

Hullhorst No. 6 Mica Undercutter

The Hullhorst Micro Tool Co., Toledo, Ohio, is marketing the electrically-operated portable mica undercutter shown in the accompanying illustration. It is claimed that this machine will undercut any commutator in one-tenth the time required when hacksaws or files are used. One of the features of the tool is the use of a small cutter ⅜ in. in diam. which facilitates guiding the tool.

This No. 6 undercutter is sturdy and compact in construction and simple in operation. It is said that an inexperienced workman can undercut mica with this machine at a speed of 100 to 200 ft. per hr. when undercutting at a depth of ⅛ in. The width of cut depends upon the thickness of the cutter.

The tool is driven by a Westing-



Hullhorst No. 6 Portable Mica Undercutter

house motor and can be operated from any ordinary light circuit of 110 volts by means of the attachment plug and cord. It is easily carried from one place to another by means of a case supplied with a leather handle.

Armstrong Spring Cutting-Off Tool

The Armstrong Bros. Tool Co., 317 N. Francisco Ave., Chicago, Ill., has recently placed on the market a line of spring cutting-off tools. These tools are made in both straight-shank and right-hand offset styles. The holder body is a forging made in the form of a goose neck so as to give the cutter resiliency to take up any chatter and to keep the work from climbing up on the tool. In this way

Armstrong Spring Cutting-Off Tool

it is said that the chances of tool breakage are greatly lessened.

The cutter is adjustable to provide any side clearance and to obtain the greatest possible amount of support. The cutters are beveled on both sides and are held at an angle to give the necessary side clearance and top rake in order to obtain a clean, smooth cut. Both the straight shank and the right-hand offset styles are made in four sizes with cutters ranging from ⅜x⅜ in. to ⅝x1 in. The size of the shank varies from ⅜x⅞ in. to ¾x1⅛ in., respectively.

NEWS OF THE WEEK

The Development and Application of Simplified Practice in Industry

Survey shows world-wide interest in standardization

SIMPLIFIED practice is being applied more and more each day to eliminate avoidable industrial waste growing out of the production of needless styles, types, and sizes of commonplace articles, according to a primer of simplified practice made public this week by the Department of Commerce.

Simplified practice is defined as a collective action of producers, distributors, and consumers, with the co-operation of the Division of Simplified Practice, Department of Commerce, to eliminate needless variety in sizes, dimensions, and types of commonplace articles to the end that production costs may be decreased while the utility and efficiency of production is enhanced.

Higher returns to the worker, savings to the consumer, greater productivity, enlarged general purchasing power, and more intelligent use of our natural resources resulting in benefits to the entire nation are cited as some of the advantages to be gained through simplified practice.

This simple and effective method of attacking waste differs from standardization in that it tends only to the elimination of odd sizes of products in small demand. It does not interfere with fashions or styles, nor does it extend to such fields as millinery, women's clothing, art goods or other articles which embody individual creativeness.

The history of the simplification movement is a record of constant abandonment of the fallacy that widely diverse or "odd sizes" tends to secure competitive advantages. The passing of this misconception had led to a point where today industries as a whole are very generally competing with other industries through simplification to broaden markets and induce the widest possible consumption of their respective products, the primer says.

Still Room for Individuality

During the last quarter of a century, in the electrical, automotive, railway, and other industries, there has been given a potent demonstration that co-operation as to the essentials and non-competitive items still leaves room for the development of individuality in other phases of the industry. As these examples have made their effect felt in their respective industries, and as other forms of co-operation brought about during the World War revealed their value, the trend toward simplification has come to the fore.

Surveys of the benefits of simplified practice have brought estimates of savings in material, time, labor, and money which run high into the millions. Fully half of the industries which have adopted simplified practice find it difficult to interpret their benefits in terms of money as their efforts become lost in a maze of other factors.

Contributing Factors

The increasing rate of consumption of natural resources as a result of enlarged demand on the part of the public for improvements in the comforts of life; increased costs of raw materials, labor, production, and distribution; and the need for effective stabilization of the social structure are given as some of the primary reasons for simplified practice.

Some of the factors contributing to the increased costs of production and a distribution which can be eliminated through the adoption of simplified practice in production are enumerated as follows:

(1) Production of excessive varieties of items based on a desire to market novelties or other goods with an individualistic stamp.

(2) Large investments in special machinery, jigs, dies, templates, and other equipment, often accompanied by large stocks of raw materials and finished goods, which become slow-moving or obsolete and result in "freezing" of assets.

(3) Slowed-up production and purposeless motion partly due to seasonal operation and to losses from changing machine adjustments or "machine set-ups" for variations.

(4) Competition with meaningless variations or substitutes often causing a lack of interchangeability of parts and lack of uniformity in specifications prevents practiced avoidance of waste by means of adequate control or stock and planned production.

(5) Lack of uniformity of packing, wasted shipping space, losses from misunderstandings between maker and user, lack of uniformity in business documentation, and handicapped fulfillment of orders.

Interest in the movement is world-wide, but in the main the approach is for a reduction of variety through standardization rather than simplified practice. In Anglo-Saxon countries the relatively greater weight is put on specifications. In Continental Europe emphasis is put on dimensional standards. Germany now has more than 1,000 approved standards, while Austria, Switzerland, Holland, Czechoslovakia, and Sweden are working along dimensional standardization, the primer states.

Under the procedure of the Division of Simplified Practice, each simplified practice recommendation must be accepted by producers, distributors, and consumers representing 80 per cent of the annual volume of the industry, it being believed that only such a proportion of acceptance will insure general application and adoption.

The Division of Simplified Practice has no power to enforce its recommendations nor does it desire any. The government offers its services merely as an effective agency in bringing together business groups on a neutral ground. The final recommendations as to the elimination of sizes, styles, and types of articles is the job of the industry itself and the adherence to such recommendations is left entirely to the business group interested.

International Conference on Human Relations in Industry

The International Association for the Study and Improvement of Human Relations and Conditions in Industry (Secretariat headquarters, Goethestrasse 10, Zürich) has organized a summer school on the "Elimination of Unnecessary Fatigue in Industry" to take place this year at the Italian Lakes (Baveno, Hotel Bellevue) from June 19 to 25. The school has been arranged in conjunction with the yearly meeting of the council and is open to all members of the association.

The association at present includes members from twenty-two different countries, membership being open to the following groups connected with industry: Directors, engineers, personnel workers, managers, forepeople, general employees, trade union officials, factory inspectors, members of industrial boards and councils, industrial research workers, educationalists, and industrial social workers generally.

The program of lectures includes the following selection: "Work and Temperament," "Work and Self-expression," "Different Industries and Different Fatigues," "The Length of the Working Day and Rest Periods," "Consideration of the Influence of Indirect Causes of Fatigue Arising from the Whole 24-Hour Situation," "The Elimination of Eye-Fatigue," "The Elimination of Ear-Fatigue," "The Influence of Posture on the Elimination of Fatigue," "The Elimination of Fatigue Caused by Extremes of Temperature, Dust, Damp, Vibration, etc."

The chairman of the school is Mrs. Lillian M. Gilbreth, consulting engineer, of Montclair, N. J.

Unemployment, with Consequent Stagnation of Trade, Is France's Greatest Problem

Machinery trade least affected at present

By Our Paris Correspondent

THE Poincaré statement of Jan. 25, which non-officially stabilized the franc at twenty-five to the dollar, is encouraging to the manufacturer who uses basic raw materials from abroad. It remains to be seen whether the policy and the forces which led up to it can be made permanently possible on a scale sufficient to keep the wheels of big business turning. M. Poincaré's policy is to let time work its magic; Monsieur Caillaux, however, immediately came out with the statement that he was in favor of an official stabilization at once.

France has been able to ship considerable gold abroad to bolster future credits. The last statement of the Bank of France shows that the state has reduced its bank loan by 900 million francs and that currency circulation has been reduced 704 million francs.

The major problem now confronting French industry is that of unemployment. France finds its million and a half foreigners somewhat in the way, now that its nationals are looking for work in numbers such as have not been known since 1921. Those actually out of work and those working part time are estimated at 50 per cent of normal.

Paris Feels Slump

The Paris district shows many lacking work in the metal trades. In the Amiens region a big plant has laid off a quarter of its force. The machinery trade in general is apparently less affected than other trades. In the electrical industry the malaise is but slight. In the Lyonnais 50 per cent of the metal trades workers are said to be affected by the situation. Unemployment here has increased 13 per cent over that of last month. In the Loire valley shipbuilding is slow but a locomotive plant is taking on special workers. At Bordeaux a shipbuilding plant with a capital of 35 millions has closed its doors as a result of failure.

Readjustment is now a question of reconciling production costs based on raw and semi-raw materials, wages and overhead with the sales end which latter has got to be stimulated by some means other than a 4-cent franc, which is still considered too high for many manufacturers to compete in foreign markets. Many items are today quoted at gold value less than they were in 1914.

Automobile production for the last year was not far below two hundred thousand units, of which that of Renault, Citroen and Peugeot formed the bulk. This is approximately 4 per cent of world production. Exports of automobiles and motor trucks formed 37.7 per cent of the total, as compared with Italy's 29 per cent and Germany's 3 per cent. French exports were essentially of small-powered, low-priced cars.

One big French manufacturer is said to have a stock of ten thousand undelivered chassis, while another is piling them up at the rate of two hundred a day in an effort to sink overhead. It is believed that the prices of French automobiles are due for a drop of at least 20 per cent if the market is to be stimulated at home and abroad. The rumored motor manufacturing combine has not actually come into being but is believed to be imminent.

Automobile engineers are about to form a specialist association on the lines of the Society of Automotive Engineers in America. Aviation engineers are to be included. Standardization of materials and methods, "normalization," as the French call it, and a genial co-operation form the principal planks of the platform. Hitherto French automobile plants have very largely played their hands alone, but a new spirit is creeping in.

The movement for standardization is gaining ground as a result of a conference between the Union of Mining and Metal Industries an the Association Française de Normalization. A beginning has already been made by constructors of railway material, the Bureau Veritas which controls shipbuilding specifications and the Electrical Manufacturers' Syndicate. The machinery and tool industry and that of farm machinery, the automobile and motor truck trades are still more or less neighboring upon chaos so far as uniformity of basic principles and practice go. France was not represented officially at the New York congress last year but will be in the future.

International Combines

The international machine wire combine, including the makers in France, Belgium, Luxembourg and Germany, has come into being and hopes to divide world markets among its members. It is expected that makers of wire nails will soon form a similar international consortium.

The French metal transforming industries employ 800,000 workers, with an annual trade of twenty-five billion francs, of which exports account for nearly five billions. Output absorbed at home is estimated at 40 per cent of the semi-raw material produced, according to a report of the French ministry of commerce, which adds further that so far as siderurgical products from abroad are concerned France may now consider herself free.

Imports of machinery and tools during the past calendar year exceeded a billion francs in value.

As for exports, with the dollar at 25 francs it is thought that France can still play an important part abroad though not to the extent that it was possible when the dollar stood 50 per cent higher.

Annual foreign trade showed an increase of imports of 15½ billion francs during the past year and exports a gain of 13 billion francs. The chief export gains were during the last six months which was the period when the franc was improving its position the most rapidly. From July to December inclusive, each month showed an excess in value of exports over imports.

Imports of raw materials for use in industries increased 10,872,365,000 francs during the year while exports of manufactured articles showed a gain of 8,543,519,000 francs. Economists consider the symptom healthy, but for a fact prices have not as yet fallen to anything like the extent of the improvement in the franc either in the home or foreign market; hence trade conditions are in a rather indefinite condition than they were three months or more ago when sales were booming.

Restricted Buying

The total foreign exchanges of France in 1926 reached 119 billion francs as compared with 90 billion francs in 1925. It is to be remembered, however, that the value of the franc was at a far lower gold equivalent throughout 1926 than it was the year before.

The Minister of Labor explains the present situation as being caused by the restriction of purchases by the consumer awaiting a fall in prices. During this period there is bound to be unemployment. As yet, in spite of the figures given by various industries and workers' associations, the government is aiding about 40,000 unemployed.

Some disposition is to be taken with respect to the hundreds of thousands of foreign workers who have come to France since the war. To replace them, if they are sent back across the frontiers, will mean that a more intensive and efficient use of mechanical aids to industry will be necessary.

Fiscal charges are weighing heavily on all industry, though the export tax of 1.3 per cent has been abrogated recently. Exports as well as home consumed articles are burdened with a multiple 2 per cent turnover tax from the mine to the finished ball bearing, from the raw copper to the completed radiator tube. Industry in transforming metal lines is demanding the suppression of this tax, but there is no relief to be hoped for this year.

Experimental Work on Iron Ores

Senator Shipstead, of Minnesota, has proposed an appropriation of $50,000, to be expended by the Bureau of Mines over a period of two years, for additional experiment work in co-operation with the University of Minnesota on manganiferous iron ores. Some experimentation has been in progress at the Minneapolis station of the Bureau of Mines in an attempt to produce commercial manganese from the low grade manganese bearing iron ores of Minnesota.

This appropriation will enable the Bureau of Mines and the University of Minnesota to experiment in the treatment of silicate and carbonate ores of manganese by some wet method.

American Worker Gains Nearly 50 Per Cent in Income

The total "current income" of the American people rose from $62,736,000,000 in 1921 to the record breaking total of $89,682,000,000 in 1926, according to preliminary figures issued last week by the National Bureau of Economic Research, of New York, in a special bulletin giving the advance results of an investigation of income.

Although the total national income has shown a remarkable increase since 1921, the growth in dollars being more than 40 per cent, this growth, says the bulletin, is not merely a fictitious quantity resulting from an increase in the price level, for the average price of direct or consumption goods was actually slightly less in 1926 than in 1921.

"The figures become much more significant when they are reduced to a per capita basis," continues the bulletin, which points out that in 1926 had the total income been divided equally among all persons including babes in arms and the helpless aged, the average income would have been $770, or one-third more than the per capita in 1921.

"When this per capita income is expressed in dollars having constant purchasing power, we find that the increase has been about 36 per cent. It appears then that from the economic point of view, the condition of the average inhabitant has been improving at a rate of about 7 per cent per annum. To many persons, figures showing the income per person gainfully occupied seem more significant than do those reporting income per capita. In the United States in 1926 there were some 44,600,000 engaged in activities yielding them direct money incomes.

"For every person gainfully occupied in 1926, there appears to have been an income of slightly over $2,000. When reduced to money of constant purchasing power we find that the average person working for a money income received about one-fourth more for his services than he obtained in 1917 and about 44 per cent more than in 1909.

"The indications are that despite the constantly growing population and the relatively inelastic nature of the supply of natural resources, new inventions and greater skill and organization are still enabling the average inhabitant to progress steadily upward on the scale of economic welfare."

Twelve Hundred Planes in Commercial Use

During the year 1926, American airplane manufacturers constructed 636 newly designed aeroplanes for commercial purposes, according to a survey published in "Aviation Notes," issued by the Daniel Guggenheim Fund for the Promotion of Aeronautics. At the first of this year approximately 1,200 modern airplanes were in commercial use in the United States.

The survey which is admittedly incomplete was made from responses to a letter asking for the number of newly designed commercial airplanes that were in use on Jan. 1, 1927, and how many were made in 1926. Some of the thirty-nine airplane manufacturers did not give complete figures, but it is believed that, for general purposes, the figures represent a fairly accurate index of commercial airplane development in the United States in respect to new types.

Europe Continues Best American Market

"After all is said about the alleged impairment of our European trade and the growing importance of our more recently developed markets in South America, Australia, and elsewhere, the fact remains that Europe is still and will long continue to be by all odds the most important oversea market for our goods," said Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, at a meeting of the Foreign Policy Association in Philadelphia on Feb. 19. Dr. Klein stated that "In 1926, 48 per cent of our total exports went across the North Atlantic, valued at $2,310,000,000 as compared with 12 per cent, $564,000,000, to Asia and 9 per cent, $443,000,000, to South America. Europe takes more than 28 per cent of our total exports of finished manufactures.

"It is apparent, then, that the tremendous drain on Europe's resources during the war, and her post-war period of retrenchment and readjustment, have by no means caused that continent to be displaced from her position as our foremost oversea trade outlet.

Should Continue to Grow

Indeed, American goods and capital have played a substantial part in this reconstruction, and as European buying power improves, there is every reason to expect that the volume of our exports to her will increase, even though their ratio to the rest of our trade, which is growing more rapidly, may not maintain quite such a disproportionate margin.

"The importance of the United States as a market for leading European nations has not waned in spite of loud protestation to the contrary. In 1913 we took 5.6 per cent of the entire exports of the United Kingdom, whereas for 1926 our share, according to preliminary estimates, was 9.4 per cent. In 1913, Germany sent us about 7 per cent of her entire exports, and in 1926 our proportion was 7.8 per cent. In 1913, we received 6.1 per cent of the entire exports of France, while in 1926 (November and December estimated) she sent us 6.4 per cent. About 6.5 per cent of all Spain's exports came to this country in 1913, whereas our share of her exports in 1925 was 10.1 per cent.

"The maintenance of the buying and lending power of the United States is still one of the great determinants of the economic recovery of Europe, and the value of American goodwill incidental thereto is fully appreciated by every well-informed observer.

Concentration of Plants and Workers Shown by the Census

For a number of years before and particularly since the war, there have been certain definite trends in the growth of large-scale manufacturing industry in the United States. There has been a tendency for an increasingly larger per cent of the total output of manufacturing industries to be produced by large companies, particularly those with an annual value of product of over $1,000,000. The number of wage earners in these establishments in proportion to all wage earners engaged in manufacturing has increased rapidly. This trend toward the concentration of manufacturing output in a relatively small number of establishments is revealed also in the fact that the average number of wage earners per establishment increased from 38.94 workers in 1914 to 44.72 workers in 1923.

Efficiency Increasing

While at the same time that these changes have been going on, there has also been a marked increase in the efficiency of manufacturing production. For the same unit of production there were required in 1923, 25 per cent less workers, and 17 per cent less salaried officers and employees. Part of this is due to the increased efficiency of management and part to the increased mechanization of industry as is indicated by the increased use of power. In 1914 the average horsepower per establishment was 125.8 as compared with 168.5 in 1923, while at the same time the horsepower per wage earner increased from 3.2 to 3.7.

These facts have become available through the Census of Manufactures which has been made biennially since 1919. The returns for 156 separate industries which have become available from the 1925 census reveal that the developments which have been in progress in late years are continuing. Further concentration of industry is indicated by the fact that there was a decrease of 2.7 per cent in the number of establishments engaged in these 156 industries in 1925, over the number that were manufacturing the same product in 1923. The number of wage earners also decreased by 1.9 per cent. Despite the decrease in both the number of establishments and the average number of wage earners employed by them the value of product increased 6.2 per cent. The trend toward the further use of power in the productive process is shown in an increase of 8.3 per cent in the primary power installed in the manufacturing plants of these establishments. In 1923 these same industries were employing on an average of 122.7 hp. per plant. In 1925 they were using 140.2 hp. The horsepower per wage earner during the two-year period rose from 2.17 to 2.40.

A tendency for wages to increase between the last two census periods may be inferred from the fact that the wage bill in 1925 was one-half of one per cent greater than in 1923, while at the same time the total number of wage earners employed declined 1.9 per cent.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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WHEN the United States emerged from the war as a creditor of almost all the world a European financier is reported to have said to an American banker: "We will pay you. We will flood you with gold until you are submerged in it to the neck and crying for help."

Fortunately we have escaped most of the inflationary horrors expected by this prophet but quantitatively he has proved to be not far wrong. In settlement of our steadily mounting credit balances most of the loose gold of the world is still coming our way. Since January first we have imported, including gold afloat, approximately $76,000,000. These imports explain the abundance of bank credit at reasonable rates that is, in the last analysis, chiefly responsible for the strength of the stock market and the demand for securities that pay an income. As long as loanable capital is abundant the security markets will probably remain resilient and the spring demand for funds will be met without stringency and probably without much higher rates.

But the news otherwise is not too exhilarating. Outside of New York, bank clearings for the week ended February 10 showed a decrease of 4.2 per cent as compared with a year ago, although including New York the decrease was only ½ of 1 per cent.

Car loadings for the week ended Feb. 5 were about 6 per cent larger than during the same week in 1926, but an analysis of the returns beginning the first week in November shows that the increases reported were due entirely to the gain in the coal traffic and that there was an actual decrease in the number of cars loaded with merchandise other than coal. The exact figures for the fourteen weeks ending Feb. 5 show that the car loadings of coal exceed those for the same weeks of the previous year by 607,377 or 24 per cent, while the loadings of merchandise other than coal show a decrease of 187,800 or 1.8 per cent. The gain in the coal traffic is plainly due to the efforts that the railroads and other large users of coal are making to accumulate a supply that will carry them through the bituminous strike into which the country appears to be drifting and which may begin April 1. The gain is thus a draft on the future which must be compensated for later.

Another incident that has attracted some unfavorable comment is the confessed embarrassment of a Philadelphia concern that did a large business in rediscounting obligations given by purchasers of automobiles. Those who have deprecated instalment selling have seized upon this incident as corroborating their views, but the troubles of the corporation referred to appear to be connected chiefly with sales of taxicabs in the Middle-West and there is nothing thus far to indicate any very widespread tieup of automobile credit.

If the automobile manufacturers are worrying about anything it is not finance, but the perennial used car problem. Stocks are said to be so large and the credits allowed on exchanges so small that would-be purchasers who visit showrooms are driving away again. As sales in the agricultural districts are rather disappointing, hope that production equal to last year will soon be justified is not very keen although the seasonal increase in output is now quite marked.

In iron and steel the reviews also report production gains and a steady if slow increase in buying. In steel, new orders are less than the output and stocks of semi-finished are therefore mounting.

In building the same mixture of good and bad is apparent for while certain types of construction are less active the volume of contracts let for public buildings and other large engineering projects is approximately as large as it was a year ago.

The contradictory reports received from these major industries confound prophecy and about all that most observers discern is that the forces which make for prosperity and those which create depression are in conflict, as they have been for the past three or four months, with the outcome still uncertain. Therefore a policy of alert opportunism still seems more popular than any other. Hand-to-mouth buying is an integral part of such a policy, and as long as the price trend upon the whole continues downward the caution which is the best insurance for the future will continue to be practised.

The House, like the Senate, has passed the McNary-Haugen bill but the President is commonly expected to veto it. As the favorable vote in each case was much less than two-thirds, the possibility that it can be passed over the veto is remote. Nevertheless the advance in cotton that is attributed to the progress the bill has thus far achieved has made many friends for it and it may be heard from again in the next Congress.

That cotton should have retained its firmness in the face of a prospective veto of the bill, and of a price thought to be too high to discourage new planting sufficiently, is the feature of the commodity markets. The rapidity with which the record-breaking crop is being absorbed is very impressive. Wool also is described as buoyant.

Abroad Great Britain's reviving prosperity deserves notice. It has now extended from textiles to iron and steel, which show large increases in production. As Britain is, next to the United States, the world's "biggest customer" this is more important than the Chinese conflict now in progress.

WHAT'S DOING IN INDUSTRY

THE IMPROVEMENT that was noted last week in the reports from industrial centers seems to be holding up. The increase in most cases is slight, but the better tone of inquiries gives promise of a steady trend upward in sales volume.

PRODUCTION activity is fair in the New England territory, special machinery being in demand from many sources. In New York, standard lines are slow but certain classes of automatic machinery are being sought by various purchasers. Industrial equipment for railroads, power plants and steel manufacturers is furnishing plenty of activity in the Canadian provinces.

CINCINNATI reports a slight increase in sales, with inquiries promising further betterment. The market is spotty in Detroit, but a few of the automobile manufacturers are beginning to issue lists for new equipment. Indianapolis reports a better demand for contractor's equipment. A slow but steady improvement is noted in the South, where building construction and public works projects are developing all over the country. Chicago places its confidence in the fact that inquiries have increased both in numbers and quality in the past week.

WITH THE FORCES of prosperity and depression still in conflict, as they have been for two or three months, a policy of alert opportunism seems more popular than any other.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CANADA

Recent orders for equipment by the railroads have had a stimulating effect on the metal working industry in Canada. The Canadian National Rys. have placed an order with the Canadian Car and Foundry Co., valued at approximately $2,000,000, for rolling equipment and with the National Steel Car Co. Orders have also been placed for 1,000 steel frame automobile cars for use on the Grand Trunk Western lines. This is only the first of what is believed to be a considerable quantity of orders which will be placed by the railroads within the next two or three weeks. The Montreal Tramways Co. will shortly place an order for fifty new street cars, and ten new autobuses, costing almost a million dollars.

Increased activity is reported in the steel industry. The rail mill of the Algoma Steel Corporation will go on double shift on March 7, to fill orders for rails placed by the Canadian National and by the Michigan Central Ry. for its Canada-Southern division. About 800 employees will be added to the payroll. The Dominion Iron and Steel Co. is also increasing its payroll. The company will shortly commence rolling 15,000 tons of rails for the Newfoundland government. The newest Quebec paper mill, the Lake St. John Power and Paper Co., has placed its steel contracts with the Dominion Bridge Co.

The Canada Machinery Co., of Galt, Ontario, is now employing more than 200 men and it is expected the payroll will shortly be increased 50 per cent. Until recently, this company had no more than 100 men on its payroll at any time.

NEW ENGLAND

Production activity continues in the New England territory with Hartford an especially bright spot, demands of current business requiring fairly large expansion in two plants at least. The Royal Typewriter Company is expanding in its new addition and between the Royal and Pratt & Whitney Aircraft Co. employment will be given to about 600 additional mechanics.

The demand for special machinery continues to increase and the situation generally prevailing is that much business is being placed. Buying by railroads has recently been quite pronounced and production machinery is in good demand, especially for export delivery. Small tools are active. The prevailing depression in the building industry is only slightly felt.

SOUTHERN DISTRICT

Southern tool and machinery business has continued to show slow but steady improvement in the last two weeks, with inquiries more active than in months.

A large road building program is planned in many Southeastern states this year, and sales to this field should be good in the next two or three months. Indications are also becoming more promising of another big building year in the Southeast, and a resultant better than normal demand for contractor's machinery. The present inquiry is very good and fair sales are being made.

Smaller machine shops are buying on a slightly better basis, but principally their purchases are of used or rebuilt equipment. Service station sales are opening up fairly well, with about a normal business in prospect, though there is a greater tendency to buy used or rebuilt equipment than usual. Railroads are inquiring on a good basis and placing a few orders for heavier equipment, but are not yet very active.

Excellent sales continue to be reported in the textile field because of the large amount of new mill construction in progress in this district, with another good season in prospect that should be equally as large as 1926.

As a whole, machinery business in the Southeast is about on the same level as it was for the corresponding period last year, and is hardly expected to exceed last year as the fore part of 1926 witnessed a much better than normal volume in this section.

CINCINNATI

A slight improvement in market conditions in the past week is reported by the majority of machine tool manufacturers and selling agents of the Cincinnati district. No decrease in volume of sales is reported by any concern and no recession of business is expected.

A fair portion of the orders booked called for several tools, but by far the greater portion of the week's business was made up of sales of single tools and replacements, of the efficiency type. Several concerns report that single sales of high-production tools, bought for experimental purposes, are now resulting in additional orders.

Greater activity is expected from the automotive field in the next few weeks, but in the past week the purchases from this source have been confined to single tools. A small number of single tools and replacements were sold to railroads and there is a general feeling that this market is about to open up.

Inquiries came in freely during the week, from all classes of users, from all sections of the country and for all types and sizes of tools. Manufacturers and selling agents regard the outlook as promising and see no reason for a pessimistic view of the immediate or distant future.

INDIANAPOLIS

Business here in the last two weeks has given manufacturers and selling agents of machine tools and machinery some encouragement. This increase was needed, since January volume fell somewhat behind the same period of the year before. With a good February and March business, it is believed the first quarter this year will show a normal increase over the same period of a year ago.

Inquiries now are being received for contractors' equipment, particularly in the road building line. Various civic units are coming into the market for road maintenance equipment.

Demand from the automobile factories continues good, better than at this time last year. All the factories in this section have good prospects and are preparing their production schedules accordingly. Railroad buying has not been heavy thus far this year, due largely to weather conditions, but with the opening of spring business from this source should improve rapidly. Farm implement manufacturers are rather liberal buyers, but many are holding off now in order to see how spring business will be. Coal hoisting and other mine machinery is quiet, there being some uncertainty concerning the markets and mine operators holding off.

NEW YORK

Activity continues at a less than normal rate in this market. Business in general machinery lines is characterized as being slow, while in some special lines it has forged ahead steadily. Very large industrialists and a few of the railroads have come into the market for tools, giving dealers reason to believe that these two sources are going ahead with plans to replace certain types of shop equipment.

The Baltimore & Ohio R.R. has issued a list for some thirty-five tools, of all types, for its shops at Mt. Clare, Cumberland and Glenwood. The General Electric Co. has a list out for about a dozen tools.

The following is a partial list of the tools ordered in the past week: A 14-in. grinder, a 6-in. vertical shaper, a 12-in. vertical shaper, 2 jig borers, an automatic centering machine, 3 bench lathes, a 16-in. geared-head lathe, 2 nibbling machines, a side-head boring machine, and a 200-ton wheel press. The market for used machinery is fair, with price concessions being the stimulant for present buying.

DETROIT

There has been no noticeable change in the machine tool and machinery field in Detroit, and the market remains very spotty, with orders fairly well distributed among the various manufacturing activities and a wide divergence in the outlook for the future reported by machinery representatives.

The recent annual statement of the General Motors Corporation exceeded expectations and apparently the G. M. C. plants are prepared for a large volume of business this year. Several lists for new equipment, most of them small, are now in the hands of machine tool men, but the actual orders for the past week have been more or less negligible.

Some toolroom equipment has been bought by Paige and by Hudson, while single machines have been installed at Dodge and Packard. Ford is very quiet and no orders are reported from that source. Chevrolet is reported as in the market for considerable new machinery for the motor division, while the Oakland and Pontiac plants have fair lists out now.

CHICAGO

The most encouraging feature of the machinery industry for the last week was the increasing number of inquiries received by manufacturers and dealers. While sales fell off slightly from the previous week, and the inquiries coming in mostly have reference to future buying, the general feeling among machinery men is to the effect that business will round out within the next month. Railroads are an unimportant factor in the market at this time, as is also the automotive industry. Most houses report February business thus far to be about on a par with that of the first half of January.

Manufacturers of grinding machines and abrasives report a slight decline in sales, due in part to lessened production in the automotive industry. Dealers in used tools are finding trade quiet, but the inquiries they are receiving are encouraging.

Justus H. Schwacke Dies in Florida

Justus H. Schwacke, former president of William Sellers & Co., Inc., of Philadelphia, died suddenly at Boca Grande, Florida, on Feb. 17. He was 79 years old, and had retired from active business only a year ago. Mr. Schwacke served the Sellers company continuously from 1862 until May of last year. He was elected secretary when the company was incorporated in 1886, a director in 1902, manager in 1905 and president in 1922. He was active in the formation of the National Metal Trades Association, the National Founders Association and the Metal Manufacturers' Association of Philadelphia.

Mr. Schwacke wanted to learn the machinist trade, and applied to Wm. Sellers when he was 14 years old. There was no opening in the shop but Sellers wanted an office boy and Mr. Schwacke took the job, remaining with the office end all his life.

He grew up with the business and was responsible for many of the changes of policy that marks the difference between the old and new methods of marketing machine products. Shafting and transmission equipment formed a good share of the business and had originally been sold by the pound in most cases. Mr. Schwacke was instrumental in having this changed so as to recognize the engineering work that was necessary in laying out power transmission installations.

Under the tutelage of William and Coleman Sellers, Mr. Schwacke acquired a keen appreciation of the many problems that confronted the builders of such machine tools and equipment as have been developed during the past 60 years or more. It was, therefore, only natural that he should become first the general manager and the president of the Sellers company after the death of Coleman Sellers, Jr.

That any man should continue with one firm for over 60 years is in itself a testimonial to his steadfastness and determination. And when this adherence to his occupation raises him from office boy to president, it shows an all around ability that is seldom found.

Management Association Meets in New York

Decentralized responsibility and centralized control were the chief topics of interest at the annual winter convention of the American Management Association, held last week at the Hotel Pennsylvania, New York. F. L. Sweetster, general manager of the Dutchess Manufacturing Co., president of the association, presided.

Some of the topics presented for discussion, with the speakers, were: "Decentralized Responsibility with Centralized Co-ordination," by Donaldson Brown, vice-president of the General Motors Corporation.

"Business Control Based on Forecasting External Conditions," by R. S. Flershem, vice-president, the American Radiator Co.

"Supervision and Leadership," by Henry C. Metcalf, vice-president, the Continental Baking Co.

"Job Analysis as a Basis of Improving Management," by H. A. Hopf, of H. A. Hopf & Co.

"The Scope of Public Relations Activities," by W. S. Vivian, the Middle West Utilities Co.

Between the sessions at which these papers were presented, there were numerous group meetings and committee conferences at which subjects relating to management were discussed and plans formulated for the broadening of the work of the association during the coming year.

Stillwell Again Heads Engineering Foundation

Lewis Buckley Stillwell was reelected chairman of the Engineering Foundation for the third time at its annual meeting held in the Engineering Societies Building, New York, on Feb. 17. Mr. Stillwell, a New York engineer, is past-president of the American Institute of Electrical Engineers and the American Institute of Consulting Engineers. He is a native of Pennsylvania, a graduate of Lehigh, and a life trustee of Princeton.

He is a member of the American Society of Civil Engineers, the Institution of Electrical Engineers of Great Britain, the American Engineering Council, the National Academy of Sciences, the Royal Society of Arts in Great Britain, the American Philosophical Society, and the Franklin Institute. His clubs include the Century, Princeton and Union League.

Arthur D. Little, founder and president of the Arthur D. Little Laboratories of Cambridge, Mass., and inventor of many chemical processes, was elected a vice-chairman. George A. Orrok, a member of the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, and the American Society of Civil Engineers, was reelected a vice-chairman.

J. Vipond Davies, representing the American Institute of Electrical Engineers and the American Society of Civil Engineers, and Dean Arthur M. Greene, Jr., of the Princeton School of Engineering were named again as members of the Executive Committee.

Other officers elected were: Director and secretary, Alfred D. Flinn; treasurer, Jacob S. Langthorn; assistant treasurer, Harry A. Lardner.

Industrial Notes

An increased production schedule with the employment of three full shifts of workmen, is planned by the Bendix Brake Co., brake manufacturers at South Bend, Ind. This expansion will take place within the next 90 days, it is stated by Vincent Bendix, president of the company. Plans also were announced for expanding the plant to twice its present size.

With a view to expanding British auto trade, five automobile companies in Australia have amalgamated into Cheneys, Ltd., with a capital of £1,000,000, of which £200,000 in 8 per cent preference shares with be issued shortly.

Henry Ford is experimenting with a "medium priced" automobile, price of which would range between that of the Ford and Lincoln cars, according to a news dispatch by the United Press based on information from the engineering laboratories of the company. No further inkling of what sort of car Ford intends to put on the market was given. It was generally believed it would be a six-cylinder car.

The Greenfield Tap and Die Corporation reports for year ended Dec. 31, 1926, profit of $544,950 after charges and depreciation but before federal taxes, comparing with $437,671 in 1925.

Suit to enjoin county officials in Indianapolis from listing and collecting tax assessments on stock of the Link Belt Co. of Indianapolis, amounting to $98,000 has been filed in the United States District Court in Indianapolis by Alfred Kaufmann of Chicago, president of the Link Belt. The complaint asserts that county officials listed the stock Jan. 10 for assessments dating back to February, 1919, when the first block of stock was purchased. It asserts that, through a trust agreement, the stock is the property of Charles Piez, president of the corporation in 1920, and now chairman of the board of directors. Delinquent taxes amount to $16,266, according to the complaint.

Business Items

The plant of the Marion Drop Forge Co., Marion, Ind., has been sold at auction to John Merneck, of Hammond, Ind.

The machine shop of the Pittsburgh & West Virginia R.R. at Carnegie, Pa., was destroyed by fire last week.

Braun Bearings, Inc., has been organized at Augusta, Me., to conduct a general machinery business. Francis J. Braun is president.

The Bristol Brass Corporation, of Bristol, Conn., held its annual meeting last week and elected William K. Sessions, Edward Ingraham and Townsend G. Treadway as directors of the company. They succeed Shiras Morris and Samuel B. Harper, deceased, and S. Ferguson, who resigned.

The capital stock of the Heine Boiler Co., of St. Louis, Mo., has been purchased by the International Combustion Engineering Corporation, of New York. The Heine plant will continue operation as a subsidiary of the New York concern, and no change in the management is contemplated at this time. The plant manufactures boilers for large power plants, office buildings, steamships, etc., and was established in 1884 as the Heine Safety Boiler Co.

The Gisholt Machine Co., of Madison, Wis., has opened an office at 722 W. Washington Boulevard, Chicago, in charge of R. E. MacCartney, who has been Gisholt's special factory representative in the Chicago district for the past year. Mr. MacCartney will be assisted by E. B. Verner, who goes into the Chicago territory with a background of several years' experience in the home office. A representative of the service department is also being included in the Chicago organization.

The Chicago Pneumatic Tool Co., of New York, announces the closing of its own offices in Dallas and Houston, Texas, incident to the appointment of Whealton & Townsend, Inc., with main offices at 120 East Brady St., Tulsa, Okla., as distributors of Chicago pneumatic products in the state of Texas. Whealton & Townsend, Inc., will maintain sales and service offices in both Dallas and Houston, and will establish additional offices elsewhere when conditions warrant the same.

The Macklin Co. has been organized at Jackson, Mich., to manufacture grinding wheels and abrasives. A plant is in process of construction which will house the manufacture of silicate, shellac and bakelite wheels. T. J. McIntyre is president of the concern. Other executives are B. F. McIntyre, vice-president; C. H. Franklin, O. H. Schultz, C. T. Cline and Carl H. Lawson. The latter will be in direct charge of manufacturing. T. J. and B. F. McIntyre were formerly connected with the Carborundum Co. and with the Waltham Grinding Wheel Co.

Personals

ARCHIBALD H. EHLE has been appointed vice-president in charge of domestic sales for the Baldwin Locomotive Works.

R. H. ANDERSON has joined the sales force of Stedfast-Roulston, Inc., of Boston, machinery dealers.

A. P. GROHENS has been elected president and general manager of the Lambert Machine Co., of Marshal, Mich.

A. B. DUNSMORE, of Wellesboro, Pa., has been appointed receiver for the Sheldon Axle & Spring Co., of Wilkes-Barre, Pa.

RALPH W. KNOX has joined the J. D. Bates Advertising Agency, of Springfield, Mass.

V. LEE has been appointed receiver for the Whipp Machine Tool Co., of Sidney, Ohio. He will operate the plant for the present.

O. B. KELLER, who was formerly associated with the Keuffel & Esser Co., is now connected with the sales department of the New York Blue Print Paper Co.

PHELPS ENGERSOLL, formerly of New York, and who has been connected with the Wilcox, Crittendon Co., of Middletown, Conn., marine hardware, has been elected second vice-president of the company.

EMMETT B. MOSELEY, formerly superintendent of the Hartford Screw Machine Co., Hartford, Conn., has been appointed works manager of the Welker-Hoops Manufacturing Co., of Middletown, Conn.

T. J. CORNWALL has been elected president of the Foundrymen's Association of Indianapolis. Guy E. Street was elected vice-president; and James H. Hooker, was re-elected treasurer.

WALTER E. HARRIS has been appointed manager of the Southeastern district for the Stephens-Adamson Manufacturing Co. of Aurora, Ill. He will have headquarters in Birmingham, Ala.

WALTER R. CLARK, general works manager of the Bridgeport Brass Co., of Bridgeport, Conn., has been appointed to succeed Robert T. Kent as a member of the executive committee of the management division of the American Society of Mechanical Engineers.

JAMES E. MCKELVEY, who was at one time president of the American Woodworking Machinery Co., and also of the Yates-American Machine Co., has accepted the management of the Industrial Development Corporation, of Rochester.

C. E. BOWDEN, for some years identified with the mill supply and machinery business in the Southeast, has joined the Southeastern sales forces of the Keith-Simmons Co., of Nashville, Tenn., specializing in the machinery and mill supply department.

GEORGE L. ANDERSON has been appointed district sales manager in Indianapolis for the Union Drawn Steel Co., of Beaver Falls, Pa. He will have offices at 1310 Merchants Bank Bldg., Indianapolis, and will be assisted by M. A. Williams.

PROF. H. F. MOORE, of the University of Illinois, addressed a joint meeting of the Springfield chapter of the American Society for Steel Treating and the Engineering Society of Western Massachusetts in Springfield, Mass., on Feb. 7. His subject was "Fatigue of Metals."

REGINALD M. CAMPBELL has been appointed as Eastern district manager, in charge of watt-hour and ampere-hour meters and electric clock sales, for the Sangamo Electric Co., of New York. Mr. Campbell has been special representative in the New York territory for the Sangamo Electric Co.

FERDINAND G. SCHULTZ, of Pittsburgh, has been appointed district sales manager for the American Foundry Equipment Co., of Mishawaka, Ind., in its western Pennsylvania territory, with headquarters in the Park Building, Pittsburgh. For the past six years Mr. Schultz has been allied with the foundry industries.

J. W. SHEEHY has taken charge of the Atlanta branch of Henry Disston & Sons, Inc., of Philadelphia, saw manufacturers. He succeeds E. F. Cooper, manager of the branch for several years, who has been transferred to the company's home office. The Atlanta branch handles the Georgia and Alabama trade.

SAMUEL P. WILLIAMS, secretary of the Hart & Hegeman Manufacturing Co., Hartford, Conn., has been elected president and treasurer, succeeding the late Shiras Morris. Mr. Williams became connected with Hart & Hegeman nine years ago and for the last five years was secretary. For twenty-four years he was identified with the Williams & Carleton Co.

EARL M. WAGNER has been appointed sales representative in the Philadelphia district for the Vandyck-Churchill Co., machine tool dealers, of New York. Mr. Wagner was formerly associated with the Lodge & Shipley Machine Tool Co., and also with the Bethlehem Steel Co. He will be located at the company's offices at 13 N. 13th Street, Philadelphia.

C. W. LIGHTHALL, who has been factory manager of the Hoover Steel Ball Co., Ann Arbor, Mich., since its formation, has been promoted to the position of general manager, filling the vacancy caused through the resignation of H. D. Runciman. This change does not affect the other members of the executive staff, as W. C. Mack continues as president; F. C. Stivers, vice-president; M. J. Fritz, treasurer; F. H. Lennox, sales manager; A. C. Shroth, assistant sales manager.

Obituaries

WILLIAM H. ROBERTS, president of the Roberts Brass Manufacturing Co., and of the Detroit Stamping Co., of Detroit, died in that city on Feb. 15. He was 48 years old.

JAMES H. PARK, formerly vice-president of the Crucible Steel Co. of America, died on Feb. 13 in Augusta, Ga. He had been associated with the steel industry for his entire lifetime.

Calendar of Local Meetings

A.S.M.E.

Cincinnati. Feb. 24. Cincinnati Engineers' Club. "Individuals in Industry Dealing with Occupational Diseases," by Dr. Cary P. McCord.

Cleveland. March 1. Carnegie Hall. "Aluminum and Its Alloys," by Dr. Zay Jefferies.

Metropolitan. Feb. 25. Engineering Societies' Bldg., New York City. General meeting under the auspices of the woodworking and the management sections.

Newark. March 28. Down Town Club, Newark, N. J. Sectional meeting of the Machine Shop Practice Division. "Plant Maintenance," by G. H. Ashman, of the General Electric Co.

National Association of Cost Accountants

Detroit Chapter. Feb. 24. "Cost Accounting as a Basis for Shaping Operating Policy," by A. W. Bass.

Buffalo Chapter. Feb. 24. "Distribution of Selling Expense by Class of Product and Territories," by Albert E. Grover; and "Essential Records for Management," by George Frampton.

San Francisco Chapter. Feb. 28. "The Determination, Classification and Distribution of Administrative and Selling Costs."

Forthcoming Meetings

American Railway Association. Engineering Division, March 8 to 10, at Chicago; Mechanical Division, June 7 to 10, at Montreal; Purchases and Stores Division, date and place not yet announced. H. J. Forster, secretary, 30 Vesey St., New York City.

American Society of Mechanical Engineers. Regional meeting, Kansas City, Mo., April 4 to 6. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

American Society for Steel Treating. Spring sectional meeting, Milwaukee, Wis., May 19 and 20. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Semi-annual meeting, White Sulphur Springs, W. Va., May 23 to 26. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

National Foreign Trade Council. Fourteenth national foreign trade convention, Hotel Statler, Detroit, Mich., May 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

Society of Industrial Engineers. Annual meeting, Hotel Stevens, Chicago, May 25, 26 and 27. George C. Dent, secretary, 608 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer meeting, French Lick Springs, Ind., May 25 to 28. C. E. Heywood, manager of meetings department, 29 W. 39th St., New York City.

National Association of Purchasing Agents. Annual meeting and "Informashow" at Grand Rapids, Mich., June 6 to 9. W. L. Chandler, secretary, Woolworth Bldg., New York City.

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association,** and the **American Supply and Machinery Manufacturers' Association,** on board the steamship *Noronic.* Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia.

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

National Machine Tool Builders' Association. First exposition of machine tools, at the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, chairman of the exposition committee. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Bldg., Cincinnati. Roberts Everett, manager of the exposition, 1328 Broadway, New York City.

The Weekly Price Guide

Rise and Fall of the Market

THOSE prices that changed during the week, did so in a downward direction. Steel sheets, black and galvanized, dropped 15c. per 100 lb. at Pittsburgh mills; fabricated brass and copper declined in Chicago; and scrap non-ferrous metals, at New York. Colored waste and abrasives sustained reductions in the Cleveland market. Connellsville coke quotations are about 50c. per ton below those of Feb. 11, despite threatened strike in bituminous mines. Demand appears better in automotive steel, railway material and supplies, tin plates, steel plates, bolts, nuts and pipe. A protracted movement in this direction is necessary before any affect upon prices can be expected. The current market is a trifle easier in pig-iron, wire products, steel structurals and scrap.

(All prices as of Feb. 18)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.19
Northern Basic	20.39
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	28.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00@4.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.15@2.25	3.50	3.15	3.89
No. 12	2.20@2.30	3.55	3.20	3.94
No. 14	2.25@2.35	3.60	3.25	3.99
No. 16	2.35@2.45	3.70	3.35	4.09
Black				
Nos. 18 to 20	2.80@2.85	3.75	3.25	4.15
No. 22	2.95@3.00	3.90	3.40	4.30
No. 24	3.00@3.05	3.95	3.45	4.35
No. 26	3.10@3.15	4.05	3.55	4.45
No. 28	3.25@3.30	4.20	4.70	4.60
Galvanized				
No. 10	3.00@3.10	4.10	3.95	4.40
Nos. 12 to 14	3.10@3.20	4.20	4.05	4.50
No. 16	3.20@3.30	4.30	4.15	4.60
No. 18	3.35@3.45	4.45	4.30	4.75
No. 20	3.50@3.60	4.60	4.45	4.90
No. 22	3.55@3.65	4.65	4.50	4.95
No. 24	3.70@3.80	4.80	4.65	5.10
No. 26	3.95@4.05	5.05	4.90	5.35
No. 28	4.20@4.30	5.30	5.15	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — Decimal	B.W.G. and Fractions	Outside Diameter in Inches — ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	32
120" or								
125"	11	.23	.25	.27	.28	.29	.31	33
134"	10	.24	26	.28	29	30	32	34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	4.50	6.00@7.50	4.65
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.90@3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛", 8.35c.; ¼", 7.85c.; ⅜" to ½", 7.35c. per lb. *Flat, ⅛"@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.25
Tin, 5-ton lots, New York			70.75
Lead (up to carlots) E. St. Louis	7.30	New York	8.00
Zinc (up to carlots) E. St. Louis	6.65	New York	7.50

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	17.00	18.50	16.25
Copper sheets, base	21.50	21.25	21.50
Copper wire, base	18.50	18.50	14.75
Copper bars, base	21.12½	20.87½	21.12½
Copper tubing, base	23.50	23.75	23.50
Brass sheets, high, base	17.87½	17.62½	17.87½
Brass tubing, high, base	22.75	22.50	22.25
Brass rods, high, base	15.62½	15.37½	15.62½
Brass wire, high, base	18.37½	18.12½	18.37½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	27.00	26.02
Zinc sheets (casks)	13.00	12 30	11 36
Solder (½ and ½), (case lots)	42.00	43.50	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	88.00
Commercial genuine, intermediate grade	61 00
Anti-friction metal, general service	31 50
No. 4 babbitt (f.o.b.)	13.25

Nickel, f.o.b. refinery, cents per lb.: Ingots 35.00 Electrolytic 39.00 Shot 36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	10 87½@11.12½	10.25	10.50@11.00
Copper, heavy, and wire	10.37½@10.87½	10.50	9.50@10.00
Copper, light, and bottoms	9 00 @ 9 25	9.00	8.50@ 9 00
Heavy lead	6 12½@ 6.37½	6.25	5.75@ 6.25
Tea lead	4.25 @ 4.50	4.25	4.75@ 5.25
Brass, heavy, yellow	6.75 @ 7.00	7.00	6.50@ 7.00
Brass, heavy, red	8.50 @ 9.00	9.25	8.75@ 9.25
Brass, light	5.25 @ 5.50	5.50	5.75@ 6.25
No. 1 yellow rod turnings	7.00 @ 7.50	7.25	7.00@ 7.50
Zinc	4.00 @ 4.25	4.00	3.00@ 3.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9 50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15
Sal soda, per 175 lb. keg	2.80	2.75	2.75
Roll sulphur, per lb	.04	.03½	.04
Linseed oil, per 7½-lb. gal., 5 bbl. lots	.84	.98	.85
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.55	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	.35	29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.1562½	.1587½	.1687½
Solder (½ and ½)	per lb.	.42	.4075	.3925
Cotton waste	per lb.	.13@17½	.13@.17½	.15@.22
Washers, cast iron (⅛ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.55	.55	55
Machine oil	per gal.	.33	.33	35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$4.95	$5.13
Emery paper	10.71	9.15	10.71
Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75

Coke, prompt furnace, per net ton	Connellsville,		3.35@3.50
Coke, prompt foundry, per net ton	Connellsville,		4.00@5.00
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry,	100 lb. kegs	New York,	15.25
Red lead, in oil,	100 lb. kegs	New York,	16.75

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for ⅜-in and smaller and 65% for ½-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{1}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all dia meters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Brookline (Boston P. O.)—M. W. Quinlan, 264 South Huntington Ave., Jamaica Plain—miscellaneous tools and equipment for repair and service garage. Estimated cost $40,000.

Mass., Dorchester (Boston P. O.)—G. V. Wattendorf, 699 Columbia Rd.—miscellaneous tools and equipment for proposed 1 story repair and service garage. Estimated cost $60,000.

Mass., Montague—Billings & Son—band re-saw, six in. blade.

Mass., Reading—Address 82 Salem St.—large drill, bench drill, anvil, power hack saw.

Mich., Detroit—Superior Piston Ring Co., 6425 Epworth Blvd.—machinery and equipment for the manufacture of piston rings for proposed extension to plant.

N. Y., Belmont—William Laidlow, Inc.—one 10 ton overhead traveling crane, one 6 x 60 in. x 16 ft. planer and one 4 or 5 ft. radial drill.

O., Canton—Bd. of Education—lathes, milling machines and drill presses.

O., Cleveland—Silver-Kaden Electric Co., 4121 Woodland Ave. H. E. Kaden, (electric lighting fixtures)—36 ft. power square shear.

O., Cleveland—J. Soos Iron Works, 1721 East 45th St.—punch and shears, ½ to ⅞ in. capacity, also electric grinder, 2 hp.

O., East Liverpool—Patterson Foundry & Machine Co.—one 25 ton crane with 5 ton auxiliary, one 110 in. one 72 to 76 in. and one 48 to 50 in. boring mills and one 78 in. engine lathe, 15 ft. swing between centers.

O., Youngstown—Youngstown Welding Co., 536 West Rayen Ave.—Ohl brake 1 in. or more stroke 20 in. between housings and one brake 12 in. stroke for bending 16 gage material.

Pa., Harrisburg—Harrisburg Pipe & Pipe Bending Co. Herr and 10th Sts.—5 ton gantry crane with lifting magnet.

Tex., Beaumont — Texas Tie & Lumber Co., 1358 Harrison Ave., Orange—3 block portable sawmill, 56 in. circular saw, 2 saw edging machine, one swinging cut-off saw, conveyors, etc. for proposed plant here.

Tex., Laredo—Auto Supply Co., c/o R. W. Wilkes, lathe, drill press, bolt cutter, punching machine, etc. for proposed 1 story, 100 x 160 ft. garage. Estimated cost $40,000.

Man., Winnipeg—J. L. Neilson & Co., 602 Main St., J. L. Neilson, Purch. Agt. — lathes (various sizes) and die making equipment.

Ont., Hamilton—Aitchison Lumber Co., Main St.—complete machinery for planing mill.

Ont., Hamilton—Dexter Lock Co. Ltd.—spot welder to handle steel plates up to 1/32 in.

Ont., Ottawa — McMullen-Perkins Ltd., P. O. Box 144—18 in. engine lathe, small surface grinder and key seater.

Ont., Penetanquishene—Dominion Stove & Foundry Co. Ltd.—automatic polishing machine for polishing range tops.

Que., Ahuntisic—O. Beaudoin, 259 Blvd. Gouin E., Montreal,—complete equipment for auto repair shop and garage here.

Que., Montreal—Automobile Ltd., 44 Ontario St. E.—complete equipment for blacksmith shop and general automobile repairs.

Opportunities for Future Business

Calif., Bakersfield—Kern County, is receiving bids for the construction of machine and blacksmith shops. Estimated cost to exceed $12,000. C. H. Biggar, Bank of Italy Bldg., Archt. Former bids rejected. Noted Feb. 17.

Calif., Los Angeles—Los Angeles County Medical Building Corp., will build a 13 story garage at Wilshire Blvd. and South West Lake Ave. Estimated cost $750,000. J. & D. B. Parkinson, 420 Title Insurance Bldg., Archts.

Calif., Los Angeles—South Western Engineering Co., 1221 Hollingsworth Bldg., awarded contract for the construction of a group of buildings for plant to include assembly, welding shops, woodworking and carpenter shops, flotation plant, laboratories, etc. Estimated cost to exceed $600,000. Total expenditure for improvements for year to exceed $1,500,000.

Calif., Oakland—Liberty Ornamental Iron Works, 2455 Valdez St., awarded contract for the construction of a 1 story shop at 21st. and Filbert Sts. Estimated cost $40,000.

Conn., New Haven—H. C. Gilbert Co., Blatchley Ave., manufacturers of electric portable fans, awarded contract for the construction of a factory. Estimated cost to exceed $40,000.

Conn., Waterbury—E. M. Jennings Co. Inc., 27 Harrison St., Bridgeport—plans the construction of a 2 story garage and repair shop on South Main St. here. Estimated cost $75,000. Private plans.

Ill., Chicago—R. G. Regan, 2322 Milwaukee Ave., awarded contract for the construction of a 1 story, 45 x 125 ft. machine shop and storage building. Estimated cost $30,000.

Ky., Paducah—Illinois Central R.R., 135 East 11th Pl., Chicago, Ill., awarded contract for the construction of an 84 x 316 ft. wood mill, 73 x 176 ft. wheel shop, 29 x 64 ft. tractor garage, 25 x 240 ft. lumber shed, etc., on Broadway here in connection with shops now under construction. Estimated cost $160,000. A. F. Blaess, Ch. Engr.

Mass., Cambridge (Boston P. O.)—M. H. Gulesian, 85 Commonwealth Ave., Newton, is receiving bids for the construction of a 2 story, repair and service garage on Green St. here. Estimated cost $60,000. Funk & Wilcox, 26 Pemberton Sq., Boston, Archts.

Mass., Dorchester (Boston P. O.)—George Steck & Co., Hilltop St., manufacturers of pianos, awarded contract for the construction of a 3 story factory. Estimated cost $140,000.

Mass., Newton Highlands (Boston P. O.)—Stewart-Marshall Realty Co., 280 Center St., Newton, awarded contract for the construction of a 1 story garage and repair shop at Walnut and Center Sts. here. Estimated cost $50,000. Architect not selected.

Mass., Quincy (Boston P. O.)—S. Scammell & Son, 12 Scammell St., awarded contract for the construction of a 1 story garage and repair shop. Estimated cost $40,000.

Mass., Salem—Dow & Lewis, 102 Lafayette St., is having plans prepared for the construction of a 1 story, 120 x 150 ft. repair and service garage on Bridge St. Estimated cost $75,000. W. Hunt & Son, 197 Washington St., Archts. Noted Feb. 17.

Mass., Somerville (Boston P. O.)—M. Bornstein, 64 Charlesgate East, Boston, awarded contract for the construction of a 1 story, 90 x 120 ft. repair and service garage on Medford St. Estimated cost $50,000. Noted Jan. 13.

Mass., Somerville—B. Goldfine, 11 Beacon St., awarded contract for the construction of a 1 story, 90 x 210 ft. repair and service garage at 172-188 Medford St. Estimated cost $50,000.

Mass., South Boston (Boston P. O.)—C. B. Cailey, 454 Broadway, awarded contract for the construction of a 1 story repair and service garage at 4th and K Sts. Estimated cost $45,000.

Mo., Kansas City—Galion Iron Works & Mfg. Co., 1321 West 9th St., awarded contract for the construction of a 1 and 2 story, 90 x 109 ft. warehouse and service building. Estimated cost $60,000. Noted Jan. 13.

Mo., Nevada—Missouri Pacific R.R. Co., Railway Exchange Bldg., St. Louis, awarded contract for the construction of a 1 story, 50 x 126 ft. machine shop. E. A. Hadley, Ch. Engr.

Mo., St. Louis—F. H. Fitch, Kansas City Structural Steel Co., 114 West 10th St., Kansas City, awarded contract for the construction of a 1 story, 70 x 105 ft. garage at 725 Lucas Ave., here.

Mo., St. Louis—F. L. and MacL. Teich and C. C. Roessler, c/o Jefferson Hotel, 12th and Locust Blvds., are having preliminary plans prepared for the construction of a 6 story garage at 13th and St. Charles St. Estimated cost $1,000,000. T. P. Barnett Co., Arcade Bldg., Archt.

N. H., Manchester—F. Gadbois, (Nash Auto Agency) 1631 Elm St., is having plans prepared for the construction of a 1 story garage and repair shop on Birch St. Estimated cost $50,000. J. N. Guertin, 801 Beach St., Archt.

N. H., Rochester—Rochester Realty Co., c/o Dow, Harlow & Kimball, 184 Boylston St., Boston, Mass., Archtgs., is having plans prepared for the construction of a 1 story, 100 x 115 ft. repair and service garage at Hanson and Wakefield Sts. Estimated cost $55,000.

N. Y., New York—Broadway and Two Hundred Thirty First St. Corp., c/o L. Stillman, 1993 Jerome Ave., Archt., is having plans prepared for the construction of a 1 story repair and service garage. Estimated cost $110,000.

O., Cleveland—The Ohio Bell Telephone Co., E. F. Morrill, Const. Mgr., 4300 Euclid Ave., awarded contract for the construction of a 65 x 220 ft. garage on West 110th St. Estimated cost $100,000. Noted Feb. 17.

O., Dayton—Daytona Garage Co., G. W. Mearick, Pres., 20 West 2nd St., will receive bids about Mar. 15 for the construction of a 4 story, 80 x 198 ft. addition to garage at 32 West Second St. Estimated cost $200,000. Schenk & Williams, Third National Bldg., Archts.

O., Lakewood (Cleveland P. O.) — M. Makoff, Williamson Bldg., awarded contract for the construction of a 2 story, 67 x 130 ft. garage at 15730 Madison Ave. Estimated cost $150,000.

O., Massillon—Griscom-Russell Co., E. H. Russell, Gen. Mgr. manufacturers of heating apparatus, plans the construction of 1 story factory on Erie St. Estimated cost $50,000 to $100,000.

Ore., Portland — W. H. Feigenson, Worcester Bldg., had plans prepared for the construction of a 5 story, 100 x 200 ft. garage at West Park and Taylor Sts. Estimated cost $300,000. Sutton & Whitney, Lewis Bldg., Archt.

Tex., Amarillo—Panhandle Sash & Door Co., 11th and Grant Sts., is having preliminary plans prepared for the construction of a shop and warehouse. Estimated cost $100,000. Private plans.

Tex., Weslaco — Weslaco Auto Co., awarded contract for the construction of a 2 story, 90 x 140 ft. garage. Estimated cost $43,338. Noted Feb. 17.

Va., Dooley—Jackson Bros. Lumber Co., plans the construction of a mill for development of 40,000 acres of Virgin soft and hardwood timber.

B. C., Vancouver—The Dominion Bridge Co., Montreal, Que., has acquired a site and plans the construction of a plant here. Estimated cost $350,000.